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Site Investigation Plan Chemetco, Incorporated

Tasks I, II and IV

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Prepared for:

CHEMETCO
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TASK I

DESCRIPTION OF CURRENT CONDITIONS

A. FACILITY BACKGROUND

1. Maps

Detailed maps and diagrams of the Chemetco Incorporated production facilities in Hartford, Illinois are enclosed with this submission as Figures 4-5 and 4-6.

2. History and Description of Facility

Chemetco Incorporated owns and operates a secondary copper smelting facility in Hartford, Illinois. Chemetco is a major producer of high purity copper and certain other metals and alloys derived for the most part from recyclable non-ferrous metal-bearing materials (scraps and residues). It purchases raw materials from throughout the United States and Canada and sells finished products throughout the United States, Canada, and Europe. In its smelting and other processes, Chemetco produces the following products: anode copper, cathode copper, crude lead-tin solder, crude zinc oxide, and an iron silicate slag that can be used in highway or railway construction and other applications.

Chemetco has served the metals industry since 1969. The company began as an Illinois corporation, incorporated June 9, 1969, as Chemico Metal Corporation. On March 23, 1970, the company merged into a Delaware corporation of the same name. In 1973 the company changed its name to Chemetco.

To provide the supply of scrap and metal-bearing materials necessary to meet Chemetco's production demands, Chemetco purchases vast quantities of these materials from throughout the United States and North America. All of these materials are recyclable and are recycled to reclaim the metals for Chemetco's products. Upon receipt by Chemetco, each lot of material is sampled for laboratory analysis.

Chemetco's metallurgical laboratory, which is also used to monitor production, has the equipment necessary to assay the weight of each sample's components so that Chemetco's chemists can determine the exact proportions of copper and other metals in each lot. Indeed, the purchase prices paid by Chemetco are determined on the basis of these assays.

Chemetco operates four 70-ton top-blown rotary furnaces known as "converters" for smelting and refining copper-bearing scrap. The input materials are processed initially in the top blown rotary converters. Molten copper is drawn off through a continuous casting system that uses a rotating 22 mold casting wheel to cast copper plates, or anodes. Chemetco uses some of these copper anodes to produce copper cathodes through an electrolytic refining process.

Chemetco's current processes receive as input and yield as products materials that might come within the definition of solid or hazardous waste if discarded. Because the input materials are all recycled and the products are sold as metals and usable products, however, these materials are neither wastes nor hazardous. Indeed, Chemetco does not generate any wastes for disposal.

Particulate matter from the converter exhaust gas is captured by a tandem double quencher/Venturi scrubber system (the "AAF" scrubber) that produces a zinc oxide material. The zinc oxide is washed from the exhaust gas by a water spray. The water-borne zinc oxide is collected as a slurry and channeled to a settling system from which the zinc oxide can be removed by pumping or by other means for further processing. Generally, the zinc oxide will be dewatered through filter presses or other means and shipped to other smelters to recover metals or to other recyclers to recover zinc chemicals or other material for use in other manufacturing operations.

All of Chemetco's current production of zinc oxide is sold for immediate delivery to customers in the United States or Europe. Chemetco accumulated a stock pile of zinc oxide during a period when the world zinc market was depressed and Chemetco was unable to find buyers for almost three years.

Slag, which is mostly comprised of FeO, SiO_2, CaO, and Al_2O_3, rises to the top of the molten metal bath in the converter and is poured off into a Kress slag hauler. The molten slag is further processed in several different ways, depending on its intended end use.

The slag is a dense material that has several commercial uses. If produced by the previously employed "slow cooled" method, the resulting material has physical properties that allow it to function as an economical construction and road building material. All of Chemetco's current slag production, however, undergoes a granulation process that produces a form of granules with physical properties making it useful on asphalt roofing shingles and as abrasive grit. Chemetco has contracted for the sale of all of its current slag production in granulated form.

3. Past Spills

To Chemetco's knowledge, only three spills have occurred at the facility. First, the cooling water canal, an open earthen trench cooling unit that was filled with water from the foundry and then pumped back into the foundry after cooling, overflowed on several occasions in 1983. This overflow occurred on the northwestern-most end of the canal and was caused by a combination of heavy rains and malfunctioning pump equipment.

Samples collected by IEPA in 1983 indicated that the water within the canal contained elevated levels of lead and cadmium. No record exists of the quantity or quality of the overflow water or precisely what areas might have been affected. Any contamination that might have occurred would be greatest in the areas immediately adjacent to the canal itself.

Chemetco's initial response to canal overflow was to raise the sidewalls around the canal. Chemetco subsequently ceased using the canal as a cooling unit and replaced it with cooling towers. To Chemetco's knowledge, there have been no such overflows since early 1984. As detailed later, the canal was closed, and large portions of the canal were backfilled to grade in 1985.

Second, the former zinc oxide pits--earthen impoundments used as settling units in the zinc oxide production process and located at the central eastern boundary of the facility--apparently overflowed at least once in late 1983. This spill was evidenced by zinc oxide residue observed just outside the pits. Excess zinc oxide sludge from the pits also apparently overflowed into the cooling water canal where the zinc oxide settled to the bottom. This zinc oxide was discovered and removed from the canal when the canal was closed. The removal was confirmed by post-excavation sampling. Use of the zinc oxide pits was discontinued in 1984 and they were subsequently cleaned out and closed.

Third, a nickel sulfate spill was reported once on the road south of the facility. Prior to November of 1984, nickel sulfate was produced in Chemetco's electrolytic refining process. At the time the nickel sulfate was being stored in drums along the southern boundary because Chemetco's electrolysis operation was not operating properly, rendering the nickel sulfate inadequate for re-use. The storage of this nickel sulfate was not a routine situation, and Chemetco does not currently store nickel sulfate drums along the southern boundary or at any other location within the facility.

4. Summary of Past Permits

Since June 30, 1970, Chemetco has requested and/or received various air operating, construction, NPDES, and RCRA related permits. Although these permits contained various permit numbers, they are all cross-referenced to either Chemetco's state or federal identification number. Chemetco's state identification number is 119801AAC. Its federal identification number is ILD048843809.

These permits, authorized within limits the release or discharge of a number of constituents, including lead, copper, zinc, nickel, cadmium, and particulate matter in general. For example, Chemetco's NPDES permit allowed effluent discharges consisting of various amounts of lead, copper, zinc, nickel and cadmium. The allowable concentrations of these constituents were limited to individual daily maximums and thirty day averaging maximums. Chemetco has been required to monitor these discharges twice monthly and submit them to IEPA no later than the fifteenth day of the following month.

Similarly, Chemetco's air operating permits allowed limited and monitored emissions of various quantities of lead, organic material, carbon monoxide, nitrogen oxide, sulphur dioxide and particulate matter. Thus, emmissions and discharges were not totally prohibited, but instead only limited.

For most of its eighteen year history, Chemetco has been in compliance with the limits contained in these permits. As evidenced by its various construction permits for pollution control equipment, Chemetco has routinely taken the appropriate measures to remain in compliance and to lessen the amount of emmissions resulting from its processes. Further, as stated below in Section C, Chemetco has repeatedly undertaken to remedy problems requiring corrective action upon becoming aware of them.

Chemetco has been involved in one United States Environmental Protection Agency ("USEPA") and two Illinois Environmental Protection Agency ("IEPA") enforcement actions related to these permits. The initial IEPA enforcement action, Cause No. PCB 83-2, was settled on March 27, 1986, when the Illinois Pollution Control Board adopted the Third Amended Settlement Agreement between IEPA and Chemetco. The other IEPA enforcement action (Cause No. PCB 84-178) and the USEPA enforcement action (RCRA-V-W-85-R-6) are currently pending subject to the outcome of settlement discussions. This plan has been prepared and is submitted in furtherance of those settlement discussions.

Chemetco's past permits requested and/or received, and enforcement actions related thereto include the following:

(a) Operating Permit No. 72090064:

Chemetco was first issued this operating permit covering its three copper melting furnaces (converters) on November 16, 1972. Thereafter, renewed operating permits were issued as follows: June 18, 1974; April 2, 1976; July 20, 1978 (application denied); December 12, 1978; July 20, 1979; September 18, 1980. The permit issued September 18, 1980, had an expiration date of December 8, 1981. Chemetco subsequently applied for renewals of this permit but these applications were withdrawn on July 9, 1981, and December 30, 1981.

IEPA enforcement action Cause No. PCB 83-2 is related to Chemetco's operation under this permit. In this action IEPA charged Chemetco with operating its facility without a permit and violating certain Illinois air pollution regulations. The Illinois Attorney General filed the complaint in this action on January 5, 1983. On June 14, 1984, the Illinois Pollution Control Board entered an order approving the Third Amended Settlement Agreement between IEPA and Chemetco, but finding Chemetco in violation of the various cited regulations. On January 14, 1986, the Illinois Court of Appeals vacated the

Pollution Control Board's decision, and on March 27, 1986, the Pollution Control Board adopted the Third Amended Settlement Agreement, finally resolving this matter.

(b) Construction Permit No. 81060046.

Chemetco first applied for this construction permit to build a fourth converter on June 16, 1981. On July 8, 1981, IEPA informed Chemetco that the application was incomplete. Chemetco subsequently reapplied on September 10, 1981. After being notified that this application was also incomplete, Chemetco subsequently withdrew its application on December 30, 1981. Chemetco finally reapplied for this construction permit on or about February 1, 1982. IEPA issued construction permit No. 81060046 on March 22, 1982.

(c) Operating Permit No. 8207005.

Chemetco received operating permit No. 8207005 on July 2, 1982, covering construction of emission sources and/or air pollution control equipment on the three copper converters. Operating permit No. 8207005 was effective August 16, 1982.

(d) Operating Permit No. 84060045.

This permit for the operation of a secondary copper smelter was filed in June of 1984. From July 1984 through February 1985 IEPA sent Chemetco several notices that the application was incomplete and Chemetco responded several times providing the requested information. Finally, on March 4, 1985, IEPA denied air operating permit application No. 84060045 stating that Sections 9 and 39 of the Illinois Environmental Protection Act might be violated.

(e) Operating Permit No. 86040033.

On April 7, 1986, Chemetco applied to IEPA for a construction permit for two baghouses. These baghouses were sought to improve control of emissions into the workplace. On May 8, 1986 IEPA sent Chemetco a Notice of Incompleteness and on June 9, 1986, Chemetco responded with additional information. Operating Permit No. 86040033 was issued in the fall of 1986.

(f) **NPDES Permit No. IL0025747.**

Permit No. IL0025747 was issued on February 25, 1977, with an effective date of March 27, 1977. Pursuant to this permit Chemetco was authorized to discharge from its facility into the Cahokia Diversion Drainage Canal. On June 27, 1985, IEPA issued Chemetco a final NPDES permit effective July 27, 1985, with an expiration date of May 1, 1990.

(g) RCRA-Related Permits.

On November 7, 1980, Chemetco filed its first RCRA Part A application for a permit under RCRA to operate a hazardous waste management facility engaged in the storage of hazardous wastes. The application listed four process units for which a permit was sought -- a surface impoundment, a waste pile, a tank, and a container. The surface impoundment consisted of the zinc oxide pits that were then being used as settling units in the zinc oxide recycling process and the zinc oxide pile that was later replaced by the present concrete zinc oxide storage bunker. The waste pile consisted of "pot slag", which did not constitute solid waste because it was totally recycled by charging to the furnaces and hence was not hazardous waste. The storage tank contained "black acid" generated by the discontinued electrolysis operation. This unit is no longer in use. The storage container consisted of two drums of unused solvent, trichloroethylene, that were being stored for later use. This solvent was completely consumed in the production process for which it was used.

Subsequently, Chemetco determined that these units listed on the original Part A application were either not involved in handling hazardous waste or were part of a recycling process. As a consequence, the units were not subject to regulation and it was not necessary to list them on the original Part A RCRA permit application. In August 1983, Chemetco announced in a letter to IEPA that it did not generate, treat, store, or dispose of any hazardous waste at its facility.

On November 18, 1980, Chemetco submitted an application to IEPA for a permit to develop a solid waste management site. IEPA denied this application on February 17, 1981.

On November 8, 1985, Chemetco filed a revised RCRA Part A application along with a RCRA Part B application. This second Part A application was filed after Chemetco had staunchly resisted any efforts to characterize any part of its operations as the storage or treatment of hazardous wastes and after it had declined to file the Part B for its previous RCRA Part A application. Chemetco filed another Part A application because of its desire to ensure that its current operating units, which are not now treating or storing hazardous wastes, would not be prevented from handling certain materials in the future just because those materials must be labeled and handled as hazardous wastes. Chemetco concluded that it would be necessary to file a RCRA Part B application and to retain interim status as a treatment and storage facility in order to avoid this dilemma.

Accordingly, Chemetco's second Part A application listed nine different storage or treatment units and numerous hazardous wastes. Several of the listed units have never existed, several are used for recycling, and none of the remaining units involve treatment, storage, or disposal of hazardous wastes. Chemetco's RCRA Part B application also listed a number of existing and proposed process units as hazardous waste units under the mistaken impression that this step was necessary in order to preserve Chemetco's ability to receive and use in its smelting and other operations materials that might be manifested as hazardous waste but that are recyclable materials from which copper and other metals or chemicals can be recovered. Chemetco does not accept or process RCRA listed hazardous wastes.

Numerous documents related to these permits and enforcement actions have been prepared for the facility. These include effluent sampling forms, NPDES discharge monitoring reports, IEPA inspection and observation reports, USEPA inspection and observation reports, complaint investigation forms, Reports of Analysis by Environmental Analysis, Inc., chemical analysis forms, special analysis forms, Chemetco closure documentation, and Chemetco SIU Slag Study analytical results. All of these documents are contained in the agency's records pertaining to Chemetco.

B. NATURE AND EXTENT OF CONTAMINATION

The location of potential source areas of contamination and/or waste management units are illustrated on the site map (Figure 4-5). A summary of the quantities, constituents and status of the various solid or hazardous wastes or materials is included in Table 1-1.

Several units and potential areas of contamination will be investigated as part of the RFI at the Chemetco facility. The area of primary interest is the southeastern corner of the facility including the adjacent off-site area to the south. Monthly sampling of monitoring wells at the site confirms a plume of groundwater contamination extending downgradient of the former floor wash water impoundment. The data, collected from early 1984 through March of 1986, was included in the groundwater monitoring plan submitted by Chemetco to the EPA, and is included here as Appendix A. It was originally also summarized in the report submitted to Chemetco by ESE, Inc.

TABLE 1.1
UNIT AND WASTE OR PRODUCT SUMMARY

Unit	Waste or Product	Quantity	Status
Zinc Oxide Pits (former)	Scrubber sludge (rep. chem. anal. in Appendix 4B-2)	Maximum inventory 1800 tons	-ZnO removed to concrete bunker -unit clean closed in 1985 -operated 1978-1984
Floor Wash Water Impoundment	Waste water - electrolyte solution containing sulfuric acid, copper, nickel, calcium, silica *(concentration unknown)*	Unknown	-removed from service, backfilled 1981 -not cleaned prior to backfilling
Cooling Water Canal	Zinc oxide sludge, contaminated sediments	Unknown	-removed from service 1985 -approximately 60% of canal was clean closed - remainder awaiting IEPA clearance to close
Zinc Oxide Bunker	Zinc oxide sludge, contaminated soils	More than 45,000 tons	-still active but not in use. -current zinc oxide production is sold
Zinc Oxide Pile (former)	Zinc oxide sludge	12,000 tons	-removed from service in 1984 -unit clean closed in 1984
Slag Storage Pile	Copper smelting slag	Approximately 180,000 tons	-still in use for slag storage -portions will be sold as fill -current production slated for sale

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A preliminar review of the above data suggests that the plume of contamination, which is characterized by low pH and high metal concentrations, is restricted to an upper hydrogeological zone. Areal limits, direction of migration and possible factors controlling both have been suggested in one previous report. ESE's hypothesis that the migration of the contaminant plume may be controlled by a northeast-southwest trending sand lens may not be accurate. The conclusion was based on data from monitoring wells which exhibit significant inconsistencies in design and construction. Variations in such factors as the depth of the screened interval, length of well screen, length of filter pack and type of seal, may have led to a mixing of data from different zones and therefore erroneous conclusions. The screened interval in some of the wells may be too deep or too long to allow definitive conclusions that contamination, specifically contamination restricted to the shallow zone, does not extend to that location. In fact the distribution of soils in this area indicates the possibility that the plume indeed may be restricted to a zone which becomes progressively thinner and shallower, possibly even discharging to the surface farther to the south. In addition, the analytical parameters included only pH, copper, zinc, nickel, boron, total dissolved solids and chloride. Excluded from the analyses were arsenic, lead and cadmium which are contaminants known to be present in the by-products produced at the facility.

Samples collected by the IEPA in 1983 suggest the possibility that some soil and groundwater contamination south of the facility may have resulted from the infiltration, run-off, or overflow of spent acid or nickel sulfate solution on the site. Analyses of water collected in a ditch along Oldenberg Road indicated concentrations of lead, cadmium and arsenic as high as 5100, 250 and 7 ppm, respectively. Chemetco excavated a trench downgradient of this area (i.e., south of Oldenberg Road) to capture this contaminated shallow ground water. Water and contaminants collected in the trench were pumped back to Chemetco's treatment system. The trench was backfilled when the subsurface interceptor drainage (SID) system was installed to serve the same general purpose.

The most likely source for this contaminant plume, however, is the floor wash water impoundment indicated as Unit 3 on Figure 4-5. This was a soil lined impoundment that contained wastewater and an electrolyte solution composed of sulfuric acid, copper, nickel, calcium and silica. Information is not available concerning the dimensions, capacity or representative chemical composition of waste contained in the unit. It was removed from service in 1980 and backfilled without prior excavation of contaminated sediments or soils. Currently, shallow monitoring wells in the immediate vicinity of the former impoundment have yielded the highest contaminant concentrations in the entire well network.

Other potential sources of groundwater contaminants in the vicinity of the floor wash water impoundment are the former zinc oxide pits.

The zinc oxide pits (indicated as Unit 2 on Figure 4-5) were 2 parallel soil-lined excavations approximately 25 feet wide, 180 feet long, and 15 feet deep that had a combined capacity of 890,000 gallons. They were located east of the foundry in the southeastern corner of the site. The zinc oxide pits were used as settling units to provide time for zinc oxide solids to settle out of the slurry pumped from the stack scrubber system. After this separation, the decanted liquid was returned, via pump and pipeline, to the scrubber circuit. When the pits filled with sediment, the settled zinc oxide solids were removed from the pits by "clamshell bucket" and were either sold in that form, or taken to adjacent concrete pads for additional dewatering. The area surrounding the pits is also being included as part of Unit 2. Eventually, dry material from the pads was removed to the second pile in the northwest corner of the site.

The perimeter around the pits was constructed of large aggregate built up to approximately 8 inches above the top level of the pit surface. They were not lined; however, a naturally occurring clay seam underlying the pits provided the principal containment.

The material stored in the pits was a crude zinc oxide. The maximum inventory was approximately 1800 tons with 45% moisture. A representative chemical analysis of the material is presented in Appendix B. A 1983 IEPA sample indicated lead and cadmium concentrations as high as 135 and 23 ppm respectively.

The pits were placed in service in the latter part of 1978 and were operated until 1984. Chemetco began the closing of the pits on January 4, 1985. The center wall that divided the east pit from the west pit was removed, effectively creating a single excavation. All of the zinc oxide material and contaminated soil was removed and placed in the ZnO storage bunker. As each section of the pit was excavated, soil samples were collected at established grid points. The sampling grid was laid out in the pit as shown in Figure 1-1. Grid intervals were approximately 20' X 40' on the bottom of the pit and approximately 10' X 40' on the side and end walls. A total of 44 samples were collected and analyzed for lead and cadmium using the EP Toxicity test (40 CFR Part 261, App. II). If the EP toxicity level for either was exceeded, further excavation was conducted. After satisfactory soil sample results were obtained for all portions of the pit, the pits were backfilled. A summary of the results is included in Appendix C. These results indicate that the pits were clean closed. The project was completed on February 8, 1985.

The cooling water canal (indicated as Unit 4 on Figure 4-1) will also be investigated as a potential source of contamination. The canal was an earth lined trench, approximately 3400 ft long. This canal was filled with water which came from several double jacketed steel exhaust hoods on equipment in the plant foundry operation. After circulating through the canal, this water was cooled, through conductive and convective means, and pumped back through the double jacketed hoods. The canal was never intended to be a waste management unit; however it was located close to the zinc oxide settling pits, and, both Chemetco and the IEPA have indicated that at times (specifically during 1983) excess zinc oxide sludge from the pits overflowed into the cooling water canal, where the zinc oxide was then settled. EPA samples of the overflowing slurry indicated lead concentrations of approximately 8 mg/l, cadmium concentrations of 4.3 mg/l, arsenic 1.3 mg/l and nickel 8.1 mg/l. It is unclear if these values represent total or EP toxicity concentrations. The periodic overflows and subsequent settling of the zinc oxide caused contamination of the sediments in the bottom of the canal. Chemetco at one time estimated that up to 2.2 tons of zinc oxide may have settled in the canal.

Additional samples collected by the IEPA in 1983 indicated that the cooling water within the canal contained elevated levels of lead and cadmium. This water from the canal was periodically discharged into the Cahokia Diversion Canal to the north under NPDES permit #IL0025747. EPA records indicate that, on at least one occasion (1983), this discharge contained slightly elevated levels of lead and cadmium (2.1 and 6.5 mg/l, respectively). Chemetco's monthly submissions pursuant to the conditions of this permit indicate that this was not a persistent condition.

Reports have indicated that, on occasion, sections of the cooling water canal had overflowed into the agricultural fields adjacent to the canal on the north and east. There is no record of the quantity or quality of the overflow water or precisely which areas would have been affected. As a result, a portion of this investigation includes a program for sampling soils in the adjacent off-site areas as well as sediments into the Cahokia Diversion Canal. An investigation plan is also included for the unnamed tributary to Long Lake where the current NPDES discharge point is located.

To control the further spread of contaminated sediment and water from the canal, Chemetco installed a cooling tower to replace the canal and in July of 1985 began closing the canal. The water was pumped out by the two 400 gallon per minute pumps located at the northwest end of the canal. A large crawler type backhoe, working from the top banks of the canal began by cleaning soil and sediment from both the sidewalls and the bottom. The material that was removed was placed in dump trucks and transported to the zinc oxide storage bunker at the north end of the plant.

Soil samples were collected at established grid points in conjunction with the excavation to assure that all of the contaminated material had been removed. A sampling grid was determined prior to the cleaning operation. The grid is shown in Figure 1-2. The majority of the canal was divided into 75 foot intervals except at the ends where the intervals varied from 10 feet to 40 feet. A total of 46 samples were taken. Each was analyzed using the EP Toxicity test for lead and cadmium only. Analysis was performed in accordance with SW-846: Test Methods for Evaluating Solid Waste - Physical and Chemical Methods, 1982. A summary of the analyses is shown in Appendix D. The results of the laboratory analyses indicate that the canal was clean closed.

A portion of this investigation is design to detect and evaluate potential groundwater contamination from the two canal sections that remain open.

The concrete zinc oxide bunker, located in the northwest corner of the site, is another potential area under investigation. The bunker currently contains more than 45,000 tons of zinc oxide material which is generally EP Toxic for lead and cadmium. Chemetco has taken measures to control wind dispersion of the fine grained material by covering portions of the pile with other fill material and by periodically spraying other areas with water as needed. The concrete bunker itself is designed to collect and control run-off and leachate infiltration.

The primary concerns in the area of the bunker are past infiltration, run-off and wind dispersion from the zinc oxide pile that was formerly located here. The storage pile was an area used to store and dry excess zinc oxide material removed from the zinc oxide settling pits. This area was approximately 150 feet by 200 feet. The outer edges were built up to serve as containment walls, while the center portion remained shallow to promote drying. Zinc oxide material was stored on the ground. Material in the storage pile included that which was removed from the zinc oxide settling pits, to allow the pits to continue to function properly.

The perimeter of the area was formed by drier material that was pushed up, by a front-end loader, to form a containment wall. Due to the consistency of the material no special drainage features were installed. A naturally occurring, underlying clay seam provided vertical containment.

The material stored in this area was a crude zinc oxide with 40% to 50% moisture content. The maximum inventory of material in storage was approximately 12,000 tons. This level was reached in 1984 shortly before the area was closed. A chemical analysis of the zinc oxide material is presented in Appendix B.

The closing of the zinc oxide pile began in August 1984. Material was moved from the north end of the zinc oxide pile to the concreted areas to the west. After all the zinc oxide was removed, the underlying soil was excavated until it appeared clean. A sampling grid was laid out as illustrated in Figure 1-3. Soil samples were taken and analyzed by EP Toxicity testing for lead and cadmium. Excavation continued until satisfactory results were obtained. The EP Toxicity test, 40 CFR Part 261, App II was used to determine when concentrations of lead and cadmium in the soil had reached acceptable levels. Results of the final analysis are presented in Appendix E. All of the removed soil was placed with the zinc oxide material on the concrete surface to the west. After receiving satisfactory test results, the concrete walls on the north side were formed and poured, soon to be followed by the 8" thick slab, which forms the bottom of the new storage bunker. The last concrete pour for the new storage bunker was made on October 29, 1984. After the concrete had satisfactorily cured the zinc oxide material and the excavated soil were moved from temporary storage on the concrete west of the old site, to the new storage bunker.

The soil at the bottom of the storage pile, as well as soil around the outer perimeter of the zinc pile was also stripped away and stored, with the zinc oxide material, in the new bunker, for processing or sale in the future.

A portion of this investigation is design to evaluate soil and/or groundwater contamination which may have occurred as a result of the previous activities in this area.

The slag storage area is located in the northeast corner of the facility. It currently contains in excess of 180,000 tons of copper smelting slag material. The slag is not EP Toxic and therefore is not a hazardous waste or RCRA regulated material. A representative analysis of several process control slag samples is included in Appendix F.

Until the end of 1985 any runoff from the slag pile would most likely have been collected by the cooling water canal which bounded the pile on four sides. Potential contaminants transported in this way would therefore be subject to the same paths and limitations as flow from the canal, and hence are addressed by this investigation (since it addresses the canal as a potential source).

Leaching tests that were designed to simulate natural conditions, were performed by Chemetco in conjunction with Everett and Associates in 1986. Their report indicated that the buffering provided by the fine grained fraction of the slag material substantially reduced the concentration of metals leached from the slag as a whole. This, in conjunction with the natural attenuation capacity of local "Bottoms" soils, would prevent contamination of the groundwater with slag leachate. This investigation plan includes a proposal to monitor groundwater quality both upgradient and downgradient of the unit to prove that theory.

Wind dispersion of contaminants from this unit is not considered a significant factor because: 1) the largest percentage of the material appears to consist of size fractions too large to be transported under typical conditions (i.e., generally assumed only 1% of material is silt size or less) and 2) the finer size fractions are described as being composed primarily of iron-silica rich glasses that are unlikely to contain significant concentrations of easily leached metals.

It does not appear likely that the contamination from Chemetco has had any significant impact on human health. Although a 1982 EPA memo indicated that groundwater at nearby homes was contaminated, no data could be found in the available records to substantiate this suggestion. Few homes exist in the immediate vicinity of the site. Two of those, which are currently occupied, are situated downgradient of the plant. Both are separated from the plant by the unnamed tributary to Long Lake which probably would intercept shallow groundwater flow. In addition, at least one of these homes receives domestic water from the Chemetco plant wells and has potable water for consumption delivered. Information pertaining to the other residence is not currently available.

Crops for human consumption are cultivated in the fields located immediately to the north and east of the facility. Although portions of these fields might potentially be contaminated, this has not been verified. Precisely which areas may be contaminated, what concentrations exist and the extent to which contaminants would be uptaken by the plants is presently unknown. The proposed soil sampling effort will address this issue.

C. IMPLEMENTATION OF INTERIM MEASURES

1. Interim Remedial Measures

Upon becoming aware of problems necessitating corrective action, Chemetco has repeatedly undertaken remedial measures at the facility. The objectives of these remedial measures have been to prevent possible groundwater contamination through spills or leaching, to collect any contaminated water that might otherwise migrate further downgradient of the facility, and to monitor groundwater for the purpose of assessing the need for further corrective measures. These remedial measures include the following:

(a) Acid Recovery Trench

The acid recovery trench was dug downgradient of the floor-wash water impoundment area, on the south side of Oldenberg Road, as a remedial measure to collect contaminated groundwater for subsequent decontamination. This mitigated a potential threat to the environment by collecting contaminated water that may have otherwise migrated further downgradient of the facility. This trench was subsequently filled in 1984 and replaced by the SID system.

(b) SID System

After assessment of groundwater monitoring data in 1984, Chemetco installed a subsurface interceptor drainage (SID) system on the south side of Oldenberg Road downgradient of the floor-wash water impoundment area to collect contaminated groundwater. The groundwater is pumped back to the plant and recycled. This system replaced the acid recovery trench and serves as a more effective method of collecting contaminated water that might otherwise migrate further downgradient of the facility.

(c) Closure of the Zinc Oxide Pits

All of the dirt-lined zinc oxide pits were closed between January 4, 1985, and February 8, 1985. The pits were no longer used for settling of the zinc oxide, and that process is now accomplished in concrete units. The pits were closed "clean" by removing all contaminated material and soil from the pits and surrounding ground to the concrete zinc oxide bunker.

(d) Closure of the Cooling Water Canal

The closing of the cooling canal began in early July 1985. The water was pumped out by the two 400 gallon per minute pumps located at the northwest end of the canal. A large crawler type backhoe, working from the top banks of the canal began cleaning both the sidewalls and the bottom. A very small quantity of zinc oxide was found on the bottom of the canal in comparison to the total quantity of cooling water in the canal. The zinc oxide material that was removed was placed in dump trucks and transported to the zinc oxide storage bunker at the north end of the plant. The canal cleaning process was completed on September 26, 1985.

(e) Closure of the Zinc Oxide Storage Pile

The closing of the storage area began in August, 1984. Material was moved from the north end of the storage area to the concreted areas to the west. This was accomplished with both a crawler-loader and a rubber-tired, front-end loader. After all the zinc oxide was removed, the underlying soil was excavated until it appeared clean. Soil samples were then taken and analyzed by EP toxicity testing for lead and cadmium. Excavation continued until satisfactory results were obtained. All of the removed soil was placed with the zinc oxide material on the concrete surface to the west. After receiving satisfactory test results, the concrete walls on the north side were formed and poured, soon to be followed by the 8" thick slab, which forms the bottom of the new storage bunker. The last concrete pour for the new storage bunker was made on October 29, 1984. After the concrete had satisfactorily cured, the zinc oxide material and the excavated soil was moved by rubber-tired, front-end loader from temporary storage on the concrete west of the old site to the new storage bunker.

(f) Installation of Monitoring Wells

Beginning in 1981, Chemetco installed groundwater monitoring wells up and downgradient of the former floor-wash impoundment area. Initially these wells were sampled on a monthly basis. Now these wells are sampled quarterly in accordance with the ground-water assessment plan submitted by Chemetco to IEPA in September 1986.

TASK II

PRE-INVESTIGATION EVALUATION OF

CORRECTIVE MEASURE TECHNOLOGIES

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The individual on-site waste management units and source matrices at the Chemetco site are listed in Table 2-1. The table also describes probable or potential modes of contamination from each unit. Table 2-2 summarizes matrices and modes of potential off-site contamination.

At the present time, available information related to the nature, degree and extent of contamination at the site is insufficient to definitively select the most appropriate alternative corrective measures that will be protective of human health and the environment. Based upon an overview of the existing data, however, potentially feasible remedial action alternatives deemed appropriate to either: (1) eliminate or control the on-site sources of contamination or (2) limit its migration, include one or some combination of the following:

- Surface sealing/capping
- Removal, treatment and/or disposal of waste material
- Removal, treatment and/or disposal of contaminated soil
- In-situ solidification of waste or soil
- In-situ treatment (neutralization or immobilization)
- Surface water (runoff) diversion, collection and treatment
- Subsurface drains or groundwater collection trenches
- Groundwater pumping (with or without impermeable barriers) and treatment.

Final selection of corrective measures alternatives to control or mitigate off-site contamination will depend upon the matrix and level of contamination. The methods being given preliminary consideration for the purpose of assuring a complete and effective plan of investigation include, in addition to those listed above:

TABLE 2-1
UNITS, SOURCES AND MODES OF CONTAMINATION
(ON-SITE)

Hazardous Waste Management Units	Source Matrix	Potential Modes of Contamination
Floor Wash Water Impoundment	Residual Soil	Surface Water (runoff) Ground Water (direct leachate infiltration) (runoff infiltration) Soil (residual contamination)
Solid Waste/Material Management Units		
Slag Piles	Slag Contaminated Soil	Atmospheric (wind blown particulates) Surface Water (runoff) Ground Water (direct infiltration) (runoff infiltration) Soil
ZnO Bunker	Waste/Sludge Residual Soil	Atmospheric (wind blown particulate) Surface Water (runoff) Ground Water (direct leachate infiltration) (runoff infiltration) Soil (residual contamination)
ZnO Pits	Residual Soil	Atmospheric (wind blown particulates) Surface Water (runoff) Ground Water (direct leachate infiltration) (runoff infiltration) Soil (residual contamination)
Cooling Canal (closed)	Residual Soil	Groundwater (direct leachate infiltration)
Cooling Canal (open)	Sediments Contaminated Soil	Surface Water (runoff overflow) Ground Water (direct leachate infiltration) (runoff infiltration) Soil Sediments

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- Sediment removal by dredging and treatment or disposal
- In-situ sediment control and/or containment by covering, sealing or grouting.

This list should not be considered all-inclusive, but rather a summary of remedies used successfully in past actions. Additional investigation and findings at the Chemetco site or emergence of new technologies may allow other options to be evaluated during the corrective measures study.

A number of general factors must be considered in evaluating the feasibility of each option and selecting the most appropriate remedial action:

- Heavy metals, particularly lead and cadmium, and in some areas low pH are the primary contaminants. In addition, nickel and arsenic might conceivably be present at levels of concern. These metals have low to moderate solubilities at low pHs and become considerably less mobile and/or able to be precipitated under neutral or alkaline conditions.
- In most units, the primary mode of contamination is suspected to be the leaching of metals from either the waste sludge itself or from previously contaminated soil.
- The plant is now and will continue operating in the foreseeable future.
- Chemetco has already undertaken several interim measures that it believes have eliminated or controlled contamination from a number of the potential sources listed in Table 2-1.

The nature of contamination at the Chemetco facility is such that treatability studies, compatibility testing and similar evaluations will not generally be necessary during the corrective measures study. Any contamination detected to date has been due to releases of inorganic materials (heavy metals) or acids which have caused a change in pH of soil and groundwater; those basic findings are not expected to be changed significantly by the RFI. With regard to remediation of pH and metal contamination problems, extensive proven technology already exists in this area. It is expected, therefore, that "off the shelf" types of treatment/disposal technologies will be applied as corrective measures.

TASK IV

FACILITY INVESTIGATION

The proposed RFI work plan has been designed to focus on units of concern as identified in settlement discussions to date. Due to the size of the Chemetco facility and the number of areas of potential concern, especially off-site receptors, this investigation proposes a phased approach to define the nature, extent and source(s) of contamination. Similar in many ways to a remedial investigation, it focuses early efforts on locating any contamination off-site which presents a danger to human health and the environment and to which access cannot be restricted. In addition, it will serve as a major first step in quantifying the extent of contamination problems and laying the groundwork for Chemetco to begin to address any releases from a "unit source" viewpoint. These initial studies will also allow Chemetco and IEPA to determine the need for interim corrective measures and, should such measures be necessary, facilitate implementation on a fast-track basis.

In the initial phase (see Figure 4-1) groundwater samples will be collected from a limited number of representative wells and analyzed for priority pollutants to detect any contamination unknown to date (e.g., acid extractables, base neutrals, etc). The major first round sampling effort can then be modified to include additional parameters, if necessary prior to sampling of all wells. Soil samples will also be collected from known off-site areas of suspected contamination and analyzed for pH and the initial parameters of concern to determine the need for interim corrective measures and modifications to the sampling plan. Phase 2 (Figure 4-2) includes the initial round of complete sampling for all media, incorporating any modifications resulting from Phase 1. The primary purpose of this second phase is to establish background conditions and to identify those areas that will require more detailed investigations. It is then expected that certain areas or units can be eliminated from the list of potential concerns allowing greater concentration of effort in other areas. Information gathered in Phase II will be evaluated in conjunction with that already available to establish the need for and locations of additional sampling points, design further detailed sampling plans, evaluate sampling procedures and further refine the scope of analytical parameters. Subsequent Phase III (Figure 4-3) will be designed and implemented to determine more precise limits of contamination and allow quantification in preparation for the corrective measures study. Phase IV (Figure 4-4) will then consist of summarizing results, assuring that all necessary data have been collected and preparation of a report of findings.

A. Environmental Setting

1. Hydrogeology

Information pertaining to the regional geologic and hydrogeologic setting and conditions at the Chemetco facility will be obtained from the existing and available references including those listed in Table 4-1. Since the depth to bedrock beneath the site is indicated as being greater than 110 feet (Emmons, 1979), and the deep unconsolidated aquifers are considered to be under artesian conditions, the stratigraphy, structure, depositional history, lithology and hydrogeologic properties of the bedrock will not be characterized in detail. These factors will have little if any bearing on the nature, extent and migration patterns of contamination at Chemetco and are therefore beyond the scope of this study.

The publications listed in Table 4-1 will provide basic information on the general stratigraphy of the unconsolidated valley deposits, their nature and general composition, recharge, discharge and withdrawal modes, regional groundwater flow patterns and seasonal variations in water level, gradient and direction.

The effects of the subtle topographic features on groundwater flow will be evaluated by comparing the land surface site map with maps of the water table configuration and/or potentiometric surface. In addition, hydrogeologic cross sections at various orientations will illustrate the relationship between the various profiles. These features include the slightly elevated areas along the facility's southern boundary and the shallow linear depression or intermittent stream bed to the south. Topography has been altered by grading and backfilling on the site. If necessary, an isopach map of the fill material will be constructed from new and existing borehole data. Aerial photographs are also available if necessary for this purpose. The detailed site map will include an area extending approximately 1000 feet outward

TABLE 4-1

REGIONAL BACKGROUND REFERENCES

Illinois R1191. Groundwater Geology of the East St. Louis Area, Illinois: R.F. Bergstrom and T.R. Walker 1956. 44p., 4 pls., 6 fig., 2 tables.

USGS WRJR 84-4180. Voelker, D.C., 1984 Quality of Water in the Alluvial Aquifer, American Bottom , East St. Louis, Illinois.

ISGS circular 225 - Selleregg, L.F., Pryor, W.A., Kempton, V.P., 1957 Groundwater Geology in South-Central Illinois ISGS, ISWS, Preliminary Geologic RPT.

ISWS Circular 112 Baker, WH Jr. 1972 GW levels and pumpage in the East St. Louis area Illinois, 1967 1971.

Geologic Map of Illinois 1967 1:500,000 (Willman, H.B.).

Landforms of Illinois 1956 (Map). .

Quaternary Deposits of Illinois 1979 (Map).

ISGS Circ 134 Emmons, J.T. 1979 GW levels and pumpage in the East St. Louis Area Illinois 1962-1977.

ISGS R1-17 - Bruin, J., Smith, H.F. 1953 preliminary investigation of GW resources in the American Bottom in Madison and St. Clair Counties, Ill.

ISGS - USGS - Kuh, J.R., Sanderson E.W., Sasman, R.T., 1982 Water withdrawals in Illinois, 1982 ISWS Circular 161.

Bergstrom, R.E. and Walker T.R., 1956, Groundwater Geology of the East St. Louis ARea, Illinois. ISGS Report of Investigation 191, p. 44.

Emmons, J.T., 1979, Groundwater Levels and Pumpage in the East St. Louis Area, Illinois, 1972-1977, Illinois State Water Survey, circular 134.

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from the north, east and west facility boundaries and no less than 1400 feet to the south. The horizontal scale of 1 inch equal to 200 feet and a contour interval not greater than 2 feet should provide adequate detail to evaluate the effects of topography.

The data available in the site specific reports listed in Table 4-2, include boring logs, geophysical surveys and a significant amount of monitoring data. A preliminary review of this data has provided the general information to aid in designing initial phases of the groundwater investigation. Future efforts may include:

- Additional borings and soil samples
- Additional monitoring wells and/or piezometers
- Pumping tests
- Slug tests
- Geophysical surveys
- Dye traces

Additional borings may be used to further characterize the nature and extent of the individual hydrogeologic zones, particularly south of the facility. At present, the southeastern corner of the site is of greatest interest.

Selected borings will be developed as additional monitoring wells, where necessary. Details of proposed efforts are found in the contamination characterization section.

A significant number of monitoring wells already exist in the area of primary concern and will be used extensively in this study. A preliminary evaluation suggests that the major shortcoming of this existing monitoring well network is a lack of clear definition of which exact hydrogeologic zone each well represents. This makes data comparisons difficult and may lead to mixing of data from different zones and erroneous conclusions. This stage of investigation plan, therefore, includes a proposal to construct a minimum number of additional wells, limited primarily to those necessary to provide more

TABLE 4-2

SITE SPECIFIC REPORTS AND REFERENCES

Environmental Science and Engineering, Inc., 1986, Report to CHEMETCO.

GEO Survey, 1986, Analysis of Pollutant Migration in the Soil Around the CHEMETCO Facility.

Horner & Shiflin, 1986, Chain of Rocks Industrial Park, Madison County, Illinois.

Willman, H. B. and Others, 1967, Geologic Map of Illinois, Illinois State Geological Survey.

Hydro-Search, Inc. 1986, Geophysical Investigation, CHEMETCO Facility, Hartford Illinois.

Everett and Associates 1987. Evaluation of Environmental Processes and Consequences of Zoning Secondary Copper Smelter Slag in Highway Embankments, Western Madison County, Illinois.

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accurate and uniform comparisons of current and future data. These will be mainly shallow wells south of Oldenberg Road. In addition, two well nests will be installed west of the "SIDS" collection trench. The need for establishing additional wells will be evaluated on the basis of boring and surface soil sample results and the initial round of water table and quality information. If necessary, additional wells will be installed as part of the Phase II investigation.

The proposed methods for new monitoring well installation and construction will include the following:

1) All groundwater monitoring wells and piezometers will be constructed of PVC materials that meet National Sanitation Foundation (NSF) standards.
2) The casing will have an inside diameter of not less than 2 inches nor more than 4 inches.
3) The well screen will be of a manufactured type not more than 5 feet in length.
4) The annular space along the screened section and extending not more than one foot above the screened section will be packed with clean, silica sand.
5) The annular space above the screened section will be sealed with bentonite. This seal will have a minimum vertical thickness of 2 feet.
6) The annular space above the seal will be backfilled with expanding cement grout (cement with 5 percent bentonite). The grout will extend above the ground surface and be sloped away from the well casing so that surface water will be diverted away from the well casing and bore hole.
7) All wells will be vented. A lockable protective casing and cap will be set in the expanding cement grout around the inner casing for protection.
8) All wells will be adequately developed to minimize turbidity within the well.

9) Appropriate tests (slug and/or pump tests) will be conducted at each newly installed monitoring well to determine the hydraulic conductivity of the unit being monitored.

10) Ground and top-of-casing elevations, referenced to the National Geodetic Vertical Datum (mean sea level), will be determined at each monitoring well. Top-of-casing elevations will be determined within an accuracy of 0.01 feet.

Completion of borings will include a geologist's log consisting of a description of color, composition (as determinable in the field), grain size and rough degree of sorting, relative moisture content and degree of consolidation. If pumping tests are warranted, a complete grain size distribution analysis will be completed on the samples from the screened interval of any well proposed as a discharge well.

Hydraulic conductivities have been determined for a number of the well locations and are recorded in the ESE report listed in Table 4-2. Additional slug tests will be conducted in new shallow wells constructed and, if necessary and appropriate, certain of the existing monitoring wells. Pumping tests, possibly used in conjunction with dye tracing would appear to be the primary means by which the nature and extent of interconnections between the different hydrogeologic zones and between various wells can be confirmed. The low hydraulic conductivities obtained from the earlier slug tests, however, suggest that pumping tests may not be feasible in the shallow zone. If this proves to be the case, following a more detailed review of the available data, alternative methods may be necessary to verify hydraulic interconnections.

Water level measurements will be obtained during the initial and all subsequent sampling rounds. The flow system, as determined from the existing and proposed monitoring well network (Figure 4-6), will be represented on water-level contour and potentiometric maps with additional hydrologic cross-sections constructed for various orientations. A comparison of data collected with that already recorded in certain of the reports listed in Table 4-2 should allow an initial evaluation of seasonal level and gradient variations. Modifications will be made in subsequent phases of the investigation as additional data is collected.

The "SIDS" collection trench, currently in operation south of Oldenberg Road, is the primary man-made feature (other than potential contaminant sources under consideration at the facility) that is likely to influence the hydrogeology. Its effect and effectiveness will be evaluated by comparing upgradient and downgradient analytical results after the individual hydrogeologic zones and their interconnection have been more clearly established.

2. Soils Characterization

An extensive soil sampling program will be conducted to determine the existence of and/or characterize areas of potential contamination at Chemetco. All of the samples collected as part of that program will include a geologist's field description of the basic properties including but not limited to:

- Color
- Stratigraphy
- Grain size distribution
- Mineral composition (if determinable)
- Relative permeability
- Relative moisture content
- SCS classification (if possible)

Those of the first phase samples being collected in areas of known contamination will include, in addition to those properties described above, a laboratory analysis of:

- Soil sorptive capacity
- Cation exchange capacity
- Soil organic content
- Soil pH

Samples for these analyses will be obtained by compositing the bottom six inch portion of each one-foot section of split spoon sample taken within each identifiable stratigraphic unit. The upper six inches of each one foot sample will be used for contaminant analysis. A minimum of 2 continuous (surface to water table) split spoon samples are planned for these purposes in the vicinity of the former "floor wash water impoundment". This is presently the most likely source area for the contaminant plume known to exist south of the facility. explain?

why 2

Basic information pertaining to the soils in the vicinity of Chemetco, including SCS soil classification, surface distribution, composition, etc. can be obtained from the "Soil Survey of Madison County" (Goddard, 1986). Based on the soils map for the Chemetco area, additional locations are proposed to obtain background data from uncontaminated samples of each soil type. Each sample will be analyzed for those parameters related to the natural attenuation capacity of the soils relative to the contaminants at Chemetco. This additional information will allow a comparison of attenuation capacity in contaminated and uncontaminated areas.

As part of the hydrogeologic investigation, the depth of the water table will be measured in any boring in which it is encountered. In addition, hydraulic conductivities will be determined for each hydrogeologic zone.

3. Surface Water and Sediment Characterization

Two surface water bodies are located in the vicinity of the Chemetco site. The Cahokia Diversion Canal is situated 1/2 mile north of the facility and an unnamed tributary to Long/Lake approximately 700 feet to the south. Process water from the facility formerly discharged into the Cahokia Diversion Canal via an NPDES permitted discharge point. At present, Chemetco discharges under an NPDES discharge permit into the unnamed tributary.

As described in Task IV Section C-3, an initial round of samples will be collected and analyzed to detect and characterize contamination in the surface waters and sediments. The results of those screening analyses will determine which, if any, water bodies or sediments will require detailed characterization.

Chemistry of natural surface water and/or sediments will be determined and described for the two bodies of surface water potentially affected by activities of the Chemetco facility, with efforts focusing on the parameters of concern in groundwater (i.e., arsenic, cadmium, lead, nickel and pH) and additional parameters required to be monitored for under the past and present NPDES permits, as necessary. Sampling points will be located upgradient of, at, and downgradient of NPDES discharge points in the Cahokia Drainage Diversion Canal and the tributary to Long Lake south of the facility. In addition, during the initial phases of the site investigation new and existing topographic maps will be reviewed and a site survey conducted to determine if units of concern at the facility contribute discharge to either surface water body at other points. Should additional points of discharge be found, sampling efforts consistent with those mentioned previously will be initiated. Sampling points being proposed at this time are described in Section C(3). The need to conduct additional sampling and analyses will be decided based upon the results of water and sediment characterization from the initial screening work proposed here.

4. Air Characterization

No topographic or man-made features that would significantly affect emission patterns for the units of concern are present at the facility. Information regarding prevailing wind direction is presented above. Meteorological data collected in the area of the Chemetco facility indicate both northerly and southerly prevailing wind directions. If particulate emissions from any of the units have occurred, contamination should be indicated by presence of constituents in soils downwind of the units. Soil sampling is designed to detect potential wind dispersion of contaminants. This sampling also will follow a phased approach beginning with sample points at or near the property boundary to detect any potential for off-site contamination. If contamination is detected, efforts will then be focused on potential individual sources on-site.

B. <u>Source Characterization</u>

Using available facility records, sample analyses, agency inspection reports, and other available information, Chemetco will characterize wastes and potentially hazardous material, at the facility and the areas where those materials have historically been placed. These efforts will focus on the five units of concern identified at the facility, individual modes of operation and waste material matrices.

1. Concrete Zinc Oxide Storage Bunker (Location of Former Zinc Oxide Pile)

The concrete storage bunker is located in the northcentral portion of the site, indicated as Unit 1 on Figure 4-5. The bunker is best described as a solid material storage pile which is contained on four sides by free standing reinforced concrete walls and set atop on 8 inch thick reinforced concrete slab.

This bunker has been in use since October of 1984 and at present contains more than 45,000 tons of zinc oxide containing material, including a zinc oxide/soil mixture excavated during Chemetco's closure of three other units on the site. All zinc oxide material currently produced is sold and shipped off-site and therefore not added to the bunker. Chemetco plans to reduce the current bunker inventory through sales.

Special design features include, in addition to the concrete walls and floor, a leachate and run-off collection and recirculation system and a surface sprinkler system used when necessary to control particulate dispersion.

The concrete bunker replaced the zinc oxide pile (used from 1978 to 1984) that formerly occupied the same location. The pile was used to store semi-solid zinc oxide material which was settled or concentrated in the zinc oxide pits. The maximum inventory in storage was estimated at 12,000 tons in 1984 at approximately the time the concrete bunker was completed. Approximately one-half of the zinc oxide material was temporarily relocated to a concrete slab area west of the storage pile. Underlying soil was excavated from this area, remaining in place soil tested and regraded, and then portions of the concrete walls and floor constructed. The remaining zinc oxide pile was then transferred onto the newly and partially constructed bunker. This remaining area was then excavated, tested, regraded, and the concrete bunker construction completed. The zinc oxide material temporarily located west of the old pile storage area was then placed into the completed bunker. Chemetco has prepared a closure documentation report describing the results of the sampling program designed to monitor the "clean up" excavation of the area beneath the zinc oxide pile prior to the pouring of the concrete slabs. Those results, discussed in Task 1 and presented as Appendix E, indicate that soil affected by operations of the former pile was removed prior to installation of the zinc oxide bunker and in effect, clean closure was accomplished. The RFI work plan elsewhere proposes groundwater monitoring as an initial investigatory step to demonstrate that no continuing releases have occurred and further to demonstrate that clean closure was accomplished.

The zinc oxide material was a semi-solid sludge containing up to 40% moisture. The sludge was produced by a double quencher/venturi scrubber system which uses a water spray to remove the material from the process exhaust gas. The zinc oxide was then settled from the slurry and removed to the pile or bunker. Representative chemical analyses of the material appear in Appendix B.

2. Zinc Oxide "Dirt Pits"

The zinc oxide consisted primarily of two earth lined impoundments located in the southeast corner of the facility and indicated as Unit 2 on Figure 4-5. The total design capacity of the pits was approximately 890,000 gallons or 4400 cubic yards. Semi-solid zinc oxide sludge that accumulated by settling from the slurry was periodically removed from the pits to concrete drying pads and eventually to the zinc oxide pile. When the pits were closed in 1985 approximately 5,760 tons of zinc oxide and contaminated soil were removed to the concrete storage bunker.

The zinc oxide pits included 2 parallel dirt-lined excavations approximately 25 feet wide, 180 feet long, and 15 feet deep located east of the Foundry and scrubber areas. The slurry from the scrubber system was pumped to the zinc oxide pits. The zinc oxide pits were used as settling units to provide time for the zinc oxide solids to settle out of the scrubber slurry. After this separation, the decanted liquid was returned, via pump and pipeline, to the scrubber. The zinc oxide solids were removed from the pit by clamshell bucket and were either sold in that form, or taken to one of two concrete drying pads for additional dewatering.

The perimeter around the pits was constructed of large aggregate built up to approximately 8 inches above the top level of the pit surface. Because of the batch type operation of the pits they had no special drainage features. The pits were not lined. A naturally occurring clay seam underlying the pits provided the principal containment. The material stored in the pits was a crude zinc oxide. The maximum inventory was approximately 1800 tons with 45% moisture. The chemical analysis of the material is identical to that listed in Appendix B.

As each section of the pit was excavated, soil samples were collected and analyzed in accordance with a grid system. If the EP Toxicity level for lead or cadmium was exceeded, further excavation was conducted. After satisfactory soil sample results were obtained for all portions of the pit, the pits were backfilled. The process and resulting chemical analyses are described in Chemetco's Closure Documentation Report.

Because potential off-site contamination resulting from operation of the pits is a concern the initial phases of the RFI work plan propose soil sampling to delineate the affected area, if any. Sampling will proceed until all areas of off-site contamination resulting from operation of the pits have been delineated. Subsequent phases are designed to confirm previous removal of materials such that on-site soil contamination has been remedied and that ground water has not been contaminated by past operation of the pits.

The concrete drying pads were also previously removed from service and are now being used for equipment storage. The RFI will initially include a visual inspection to confirm that all zinc oxide has been removed and, in subsequent phases, soil sampling around the limits of the pads to identify any on-site soil contamination.

3. Former Floor Wash Water Impoundment

The floor wash water impoundment was located in the southeastern corner of the facility. The approximate location is indicated on Figure 4-5 as Unit 3. Prior to 1980, electrolyte on the floor of the "tank house" was washed into the impoundment for storage. The electrolyte contained sulfuric acid, copper, nickel, calcium and silica. A complete chemical analysis of the material is not available.

The impoundment consisted of a single, unlined unit. Information pertaining to its size or design capacity is unavailable. It was removed from service in 1980 when it was backfilled. There is no indication that the impoundment was cleaned before backfilling took place.

A monitoring well network was established in 1981 to determine the effects of the closed impoundment on ground water in the immediate vicinity. The former impoundment constitutes the most likely source of the contaminant plume which exists south of the facility and is the principal subject of this investigation.

4. Cooling Water Canal

The cooling water canal formerly skirted a portion of the east and north boundaries of the facility. An outline of the portion of the canal which remains open is indicated on Figure 4-5 as Unit 4. An outline of the entire canal including the closed portions appea in Figure 1-1.

The cooling water canal was an earth lined trench, approximately 3400 ft long, with a design capacity of 700,000 gallons. This canal contained non-contact cooling water that came from several double jacketed steel exhaust hoods on equipment in the plant foundry operation. By circulating through the canal, this water was cooled, through conductive and convective means, and pumped back through the double jacketed hoods.

The canal also served as the water supply for the plant fire protection system, and as a source of make up water for the evaporative losses in the "AAF" pollution control system.

The cooling water canal was never intended to be a waste management unit. It was located close to the zinc oxide storage pits, however, and there were occasions when de minimis amounts of excess zinc oxide overflowed from the storage pits and into the cooling water canal, settling on the canal bottom. The zinc oxide material was EP Toxic for lead and cadmium.

The cooling water canal was originally intended as an open cooling unit for clean water only, and consequently had no special containment features except for raised sidewalls. These walls prevented the canal water from overflowing its boundaries and flooding the adjacent areas in the event of a malfunction of the automatic level control system. The canal level was controlled by electrical probes and pumps. Additionally, a manual level indicator was installed and incorporated into a daily plant inspection schedule.

The material which spilled over into the cooling water canal was a crude zinc oxide. The total quantity of zinc oxide in the cooling water canal was estimated to be 2400 pounds.

The closing of the cooling canal began in early July 1985. Details concerning the closure and sampling during the excavation are included in Chemetco Closure Documentation Plan.

5. Slag Pile

The slag pile that is indicated on Figure 4-5 as Unit 5 is located in the northeast corner of the facility. The unit consists of a slag cooling area and storage pile. The storage area covers approximately 17,500 square yards and as of August, 1985 contained approximately 180,000 cubic yards of material. Slag is produced at a rate of approximately 217 tons per day.

The slag is an iron faylite material that varies in composition due to the variable composition of feedstock used in the smelting process. The slag contains such trace metals as lead, copper, zinc and cadmium. Slag is sampled and analyzed, during routine process control, on a per batch basis, approximately 9 times per day. An example of the chemical analyses performed is shown in Appendix F. Product inventories are recorded, daily by the production supervisor and quantified on an annual basis by an aerial photogrammetric survey.

Chemetco has entered into a contract with Southern Agri-Minerals Corporation of Alabama for the purchase of all of the slag currently produced at the Chemetco plant. In addition, the slag has physical properties that make it a particularly appropriate and economical material for use in highway and railroad construction. Chemetco is also engaged in negotiations for the sale of the existing slag material for that purpose.

Although concerns had been raised by U.S. EPA Region 5 and IEPA that Chemetco's slag might be hazardous, U.S. EPA has determined that the slag is not EP toxic. Chemetco has requested IEPA to withdrawn a previously lodged objection that has prevented the use of Chemetco's slag for highway embankment construction on Illinois Department of Transportation projects. Once this clearance has been obtained, Chemetco anticipates that the slag pile will be depleted over the next several years through sales of slag for highway construction and similar uses. Chemetco does not plan to stockpile slag in the future.

C. Contamination Characterization

As explained earlier in this work plan, contamination characterization will be conducted following a phased approach, determining first the extent of off-site contamination. Once off-site quantification efforts are completed, and the greatest magnitude of the problem defined, sampling will focus on unit or area sources on or adjacent to the facility.

1. Groundwater Contamination

A number of monitoring wells currently exist at the Chemetco Site. These were installed either as part of or as a result of previous investigations at the facility. A considerable amount of information is available from the installation and monitoring of these wells. The information includes drilling logs and construction details as well as water level and quality data collected periodically since January, 1984. A preliminary review of this data has provided a partial basis for the design of this investigation.

The greatest number of wells are located both on and off site in the vicinity of the former zinc oxide pits and floor wash water impoundment. These were located and designed to characterize 1) the suspected source area in the southeastern corner of the facility and 2) the nature and extent of the contaminant plume that is migrating south (downgradient) of the facility. Multiple wells, completed to different depths at the same location, provide the initial information pertaining to flow patterns and the vertical and lateral extent of the contamination. Many of these wells will serve the same purpose in the investigation.

A preliminary evaluation suggests two major shortcomings in the existing monitoring well network and available data. First, it is unclear exactly which hydrogeologic zone certain of the wells represent. Second, past analytical data does not include information pertaining to all of the contaminants listed in the Consent Agreement. Specifically, lead, cadmium and arsenic are not included.

This stage of the investigation includes a proposal to construct a number of new wells. The proposed wells are those deemed necessary to allow accurate and uniform data comparison, to determine which areas and/or units require further study, and to define the source, nature and extent of contamination that exists south of the facility. The existing and proposed monitoring well or well point locations are depicted on Figure 4-6. Proposed locations are preceded by the letter "P".

A total of 7 new well locations (P-1 through P-7) are proposed for this initial phase of the investigation. The objective and basic design at each location is as follows:

P-1 Single 2" well, approximately 25-30 feet deep, screened below the water table, designed to represent ground water quality downgradient of the zinc oxide bunker.

P-2 Single 2" well, approximately 25-30 feet deep, screened below the water table, designed to represent ground water quality downgradient of the slag pile and upgradient of the southern branch of the cooling water canal

P-3 Two 2" wells at the same location, depth to be determined, one screened immediately below the water table to monitor shallow ground water, a second screened 10-15 feet deeper than the first and sealed below it. These are designed and located to detect and/or monitor contamination east of the facility.

P-4 & P-5 Each consisting of two 2" wells constructed in a similar manner as P-3 and designed to detect and/or monitor shallow and/or deep contamination south of the facility and west of the "SID" system. The exact locations may have to be altered slightly from those shown depending on terrain and surface conditions.

P-6 & P-7 — Each consisting of a small 2" well, screened below the water table, designed to monitor ground water quality south of the unnamed tributary to Long Lake. Initial information suggests that shallow contaminated ground water may discharge north of the tributary and not extend south of it.

In addition a series of well points (approximately 5), indicated on Figure 4-6 as "WP" are proposed to detect and/or monitor shallow ground water contamination. These will be screened from a depth of approximately one foot to five feet.

Of the existing wells, numbers 1A, 3A and 21 will constitute monitoring points for background quality upgradient of the units and possible contaminant sources. If either well 1A or 3A are found to be contaminated, an additional well will be proposed further to the north.

A complete priority pollutant scan will be done on initial samples collected from wells 1A, 21, P-1, 8A, P-3 (shallow), 2 and 2B. Upon receipt of the analytical results, alterations may be made in the subsequent sampling plan that may include an increase or reduction in the number of analytical parameters, reduction or increase in the number of wells and in confirmatory sampling. A first complete round of samples will then be collected from all of the sampling points. At a minimum these will be analyzed for both field and laboratory pH and concentrations of arsenic, lead, cadmium and nickel. Additional contaminants detected by the initial priority pollutant scan also may be included.

2. Soil Contamination

Soil above the water table may be contaminated by any one of four possible modes. These include (1) direct leaching in the vicinity of the source, (2) contaminated surface water run-off (3) wind dispersion of contaminated particulate, and (4) periodic discharge of contaminated shallow ground water.

This phase of investigation is designed to (1) characterize the contamination in the vicinity of what initially appears to be the most likely source (i.e., the immediate area surrounding the former floor wash water impoundment), and (2) to define specific areas of off-site contamination as a result of dispersion of contaminants from on-site units by surface water run-off and/or wind. Procedures for the detailed characterization of the physical properties of the soils are described in Section IVA-2. This work will supplement the sampling conducted during the initial screening phase.

A minimum of 2 continuous split spoon samples will be collected in the vicinity of the former floor wash water impoundment and zinc oxide pits (locations indicated on Figure 4-6). These will penetrate from the surface to the water table, a depth anticipated to be approximately 10 feet. Samples will be collected from the upper 6 inches of each 1 foot section. At a minimum, the samples will be analyzed for pH, lead, cadmium, arsenic and nickel. The lower 6 inches of each 1 foot interval will be used to characterize the soil properties as described in Section IVA-2. These and the remaining soil samples will not be collected until after the results of the ground water priority pollutant analyses have been received and evaluated. The priority pollutant results may indicate the need to revise the list of analytical parameters proposed for the soil samples.

Relative to potential off-site contamination, soil samples will be collected at a minimum of 32 locations. Twenty-eight of the locations, indicated on Figure 4-6 will constitute a continuous line skirting the North, East, and South boundaries of the facility. The line will be located approximately 25 feet from the facility fence line except where restricted by physical features. Beginning adjacent to the northwest corner of the property, samples will be collected at 200 foot intervals along the line. This interval will be reduced to 100 feet in certain areas where overflow or runoff is known to have occurred. Considering the possible modes of contamination, the upper one to two feet will be sampled. In addition, a minimum of 4 background samples will be collected at no less than 800 feet from the north, south, east and west facility boundaries. All samples will be analyzed as indicated above, and subject to the same restrictions. Upon receipt of the results all will be compared statistically to the background samples to detect exceedances and to determine the areas requiring further sampling and investigation.

3. Surface Water and Sediment Contamination

Surface water and/or sediment samples will be collected in two areas: 1) the unnamed tributary to Long Lake located south of Oldenberg Road and 2) the Cahokia Diversion Canal north of the facility.

In the unnamed tributary one sediment and one water sample will be collected upstream of the NPDES discharge point. This upstream sample point will be located at the intersection of the tributary and Ill. Route 3. Since this channel is situated downgradient of the facility, this location should preclude the effects of contaminated ground water if it is discharging into the stream. Three sediment and three surface water samples will be collected downstream of the NPDES discharge point. One each, surface water and sediment will be taken from immediately downstream of the discharge point, one each at approximately 100 feet downstream and one each at approximately 500 feet downstream. All of the samples will be analyzed for pH, lead, cadmium, arsenic and nickel. The results will determine the need to characterize further the physical and chemical properties of the sediments and/or surface water in subsequent phases of the investigation.

In the Cahokia Diversion Canal only sediment samples will be collected, one approximately 100 feet upstream of the former NPDES discharge point, one immediately downstream of the discharge point and a third approximately 100 feet downstream. These will be analyzed and evaluated in the same way as the sediment samples described above. Surface water samples are not being collected since 1) the canal is upgradient of the Chemetco facility and 2) the NPDES discharge point is no longer in use.

4. Air Contamination

Entrainment into the air of materials stored in the zinc oxide bunker has been mentioned as a possible source of contaminant release. Chemetco has carried out interim measures to minimize this type of release including covering of zinc oxide with slag to minimize the exposure of entrainable materials to strong air currents, and periodic wetting of the materials to reduce their entrainability. The units of concern addressed by this RFI present no ongoing source of air emissions; consequently, no air monitoring will be conducted. If releases occurred from any of these units in the past, the medium ultimately affected would have been soil downwind of the source. This medium and potential contamination will be addressed by the soil sampling proposed in the contamination characterization effort.

5. Subsurface Gas Contamination

The units and contaminants of concern at this facility are not chemically or physically the type that could be expected to emit subsurface gases. Therefore, studies to characterize subsurface gas presence, production or transmission are not appropriate for inclusion in this RFI.

D. Potential Receptors

The media of concern in the area of the Chemetco facility include ground water, surface water and soil. Contaminant exposure may potentially result from contact, ingestion or inhalation. Potential contaminant routes of exposure include ingestion of or contact with ground or surface waters, and ingestion or inhalation of or contact with soils that are farmed adjacent to the facility.

During the RFI the present and possible future uses of the three media will be determined to the extent possible, and information provided as follows:

a) Ground water

1) type of use

i. residential or municipal potable water source,

ii. agricultural,

iii. domestic/non-potable, or

iv. industrial

2) location of use, including distance and direction within a one mile radius of facility

b) Surface water potentially affected by discharge or runoff

1) type of use

i. residential or municipal potable water source,

ii. agricultural

iii. domestic/non-potable

iv. recreational (e.g., fishing, swimming, etc.)

v. environmental (e.g., fish and wildlife propagation)

vi. industrial

2) known local users and point(s) of withdrawal

c) Soil/adjacent lands

1) Type of use, including access

i. recreational

ii. residential

iii. commercial

iv. zoning

2) relationship between significant population locations and prevailing wind direction

In addition a description of the ecology of the area surrounding Chemetco as well as any threatened or endangered species will be provided to the extent possible using currently available published information.

A demographic profile of people having regular and permitted access to the Chemetco facility and adjacent residential or agricultural properties will be developed. At a minimum, this profile will include age, sex, length of employment (for Chemetco employees) and any sensitive subgroups. This profile will include the following groups:

a) Chemetco employees

b) neighboring residents

c) farmers (including employees, as appropriate) of adjacent lands

It is expected that the most of the information described in this section will be readily available from governmental sources (e.g., Illinois EPA, Illinois Department on Conservation, Madison County officials) or can be collected by performing area surveys.

APPENDIX A

CHEMETCO GROUND WATER

MONITORING DATA

CHEMETCO GROUNDWATER ASSESSMENT 05-Jun-86

WELL NO. [illegible]

PARAMETER
(mg/l)

DATE	pH	Copper	Zinc	Nickel	Boron	TDS	Chloride
Jan-84	[illegible]	0.286	0.551	0.040	1.150	1900	[illegible]
Feb-84	[illegible]	[illegible]	1.030	0.050	[illegible]	[illegible]	[illegible]
Mar-84	[illegible]	0.743	[illegible]	0.040	0.210	2015	[illegible]
Apr-84	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1544	[illegible]
May-84							
Jun-84	[illegible]	[illegible]	[illegible]	0.040	0.800	1904	456.0
Jul-84	[illegible]	[illegible]	[illegible]	0.030	[illegible]	1910	[illegible]
Aug-84	[illegible]	[illegible]	[illegible]	0.080	[illegible]	1924	[illegible]
Sep-84	7.22	1.090	1.320	0.010	1.300	1948	430.0
Oct-84	7.12	2.490	1.660	[illegible]	1.450	1992	444.0
Nov-84	7.22	0.297	0.659	0.056	1.010	2150	523.0
Dec-84	7.01	0.705	0.741	0.080	1.170	2136	[illegible]
Jan-85	6.99	[illegible]	0.749	0.270	0.930	1968	523.0
Feb-85	[illegible]	1.550	1.370	0.460	1.010	2023	538.0
Mar-85	6.84	0.181	0.550	1.630	1.000	3522	695.0
Apr-85	[illegible]	0.657	0.377	0.070	0.850	2086	[illegible]
May-85	[illegible]	0.130	0.499	0.100	1.080	2012	484.0
Jun-85	6.53	[illegible]	0.381	0.070	0.930	2179	514.0
Jul-85	[illegible]	[illegible]	0.673	0.090	1.340	2179	494.0
Aug-85	[illegible]	0.545	1.020	2.110	0.750	3210	339.0
Sep-85							
Oct-85							
Nov-85							
Dec-85							
Jan-86							
Feb-86							
Mar-86	[illegible]	0.05	[illegible]	0.110	0.530	[illegible]	[illegible]

WELL NO.: 2

PARAMETER
(mg/l)

DATE	pH	Copper	[illegible]	[illegible]	[illegible]	TDS	Chloride
Jan-84	6.48	6.571	0.058	2.040	[illegible]	2710	174.0
Feb-84	6.39	0.063	0.059	2.000	[illegible]	3300	161.0
Mar-84	6.37	1.310	0.909	2.040	4.10	3327	172.[illegible]
Apr-84	6.51	0.263	0.069	2.320	0.130	3176	136.0
May-84							
Jun-84	6.45	0.134	0.368	2.220	0.01	3486	181.0
Jul-84	6.42	0.103	0.031	2.530	2.170	3598	[illegible]
Aug-84	6.50	0.124	0.041	2.220	1.770	3394	167.0
Sep-84	6.66	2.210	0.072	1.800	0.500	2915	193.0
Oct-84	6.[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	306[illegible]	188.0
Nov-84	6.70	[illegible]	[illegible]	[illegible]	[illegible]	3052	237.0
Dec-84	6.43	[illegible]	0.102	1.730	0.570	3236	138.0
Jan-85	6.39	0.123	0.135	1.700	0.220	3122	356.0
Feb-85	6.52	0.135	0.105	1.670	0.340	3094	178.0
Mar-85	6.11	0.044	0.110	1.950	0.150	2006	347.0
Apr-85	5.89	0.076	0.045	2.320	0.640	3380	234.0
May-85	5.71	0.170	0.057	2.640	0.050	3502	190.0
Jun-85	6.21	0.046	0.028	1.990	0.830	3327	169.0
Jul-85	6.36	0.060	0.016	1.490	0.540	2984	[illegible]
Aug-85	6.28	0.076	[illegible]	[illegible]	[illegible]	3138	231.0
Sep-85	6.27	0.191	0.027	[illegible]	0.720	2420	101.0
Oct-85	6.48	0.382	0.028	1.640	0.170	3137	115.0
Nov-85	6.32	[illegible]	0.018	1.400	0.490	3305	111.9
Dec-85	6.30	0.005	0.031	1.570	0.380	3187	203.0
Jan-86	6.47	0.044	0.048	1.840	0.350	3159	158.0
Feb-86	6.51	0.057	0.063	1.950	0.460	3212	[illegible]
Mar-86	6.70	0.014	0.034	1.940	0.550	3523	151.0

CHEMETCO GROUNDWATER ASSESSMENT [illegible]

WELL NO.: 2-B

PARAMETER

[illegible]

DATE	pH	COPPER	[illegible]	NICKEL	[illegible]	TOC	[illegible]
Jan-84	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Feb-84	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Mar-84	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Apr-84	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
May-84							
Jun-84	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Jul-84	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Aug-84	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Sep-84	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Oct-84	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Nov-84	2.35	1035.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Dec-84	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Jan-85	2.22	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Feb-85	2.37	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Mar-85	2.07	[illegible]	[illegible]	[illegible]	[illegible]	13000	[illegible]
Apr-85	[illegible]	549.0	[illegible]	430.000	[illegible]	[illegible]	[illegible]
May-85	1.86	559.0	42.700	[illegible]	[illegible]	[illegible]	[illegible]
Jun-85	2.33	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Jul-85	[illegible]	2365.0	46.500	[illegible]	[illegible]	[illegible]	[illegible]
Aug-85	2.06	2088.0	46.400	[illegible]	[illegible]	[illegible]	[illegible]
Sep-85	2.47	[illegible]	30.000	[illegible]	[illegible]	[illegible]	[illegible]
Oct-85	2.47	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Nov-85	2.37	906.0	34.300	[illegible]	[illegible]	[illegible]	[illegible]
Dec-85	2.34	352.0	35.800	[illegible]	[illegible]	[illegible]	[illegible]
Jan-86	2.40	3230.0	34.100	[illegible]	[illegible]	[illegible]	[illegible]
Feb-86	[illegible]	370.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Mar-86	[illegible]	[illegible]	28.200	[illegible]	[illegible]	[illegible]	[illegible]

CHEMETCO GROUNDWATER ASSESSMENT 30-Jun-86

WELL NO. [illegible]

PARAMETER
(mg/l)

DATE	pH	Copper	Zinc	Nickel	Boron	TDS	Cloride
Jan-84	7.53	0.534	0.165	0.300	0.200	1750	490.0
Feb-84	[illegible]	0.046	0.154	0.050	[illegible]	1800	465.0
Mar-84	7.33	0.016	0.129	0.020	0.730	1698	425.0
Apr-84	7.47	[illegible]	0.120	0.910	0.750	1571	385.0
May-84							
Jun-84	7.61	0.041	0.172	[illegible]	0.550	1633	[illegible]
Jul-84	7.40	0.950	0.219	0.050	1.120	1724	375.0
Aug-84	7.53	0.059	0.203	0.050	1.040	1635	358.0
Sep-84	7.56	0.013	0.210	<.01	0.660	1686	365.0
Oct-84	7.49	2.180	0.221	1.310	1.010	[illegible]	375.0
Nov-84	7.73	0.078	0.155	0.080	1.140	1764	523.0
Dec-84	7.44	0.003	0.198	0.090	1.000	2096	514.0
Jan-85	7.25	0.221	0.290	0.240	1.050	3358	1047.0
Feb-85	7.38	0.029	0.296	0.110	0.970	3714	1106.0
Mar-85	7.16	0.003	0.290	0.020	0.720	3262	949.0
Apr-85	6.59	0.029	0.403	0.080	1.520	5712	1726.0
May-85	6.56	0.057	0.484	0.170	1.370	7284	496.0
Jun-85	7.04	0.047	0.618	0.140	1.330	9138	2470.0
Jul-85	6.92	0.065	0.524	0.120	2.000	7902	2521.0
Aug-85	6.85	0.066	0.583	0.760	1.620	9432	2886.0
Sep-85	6.99	0.063	0.695	0.130	2.210	8328	2335.0
Oct-85							
Nov-85							
Dec-85							
Jan-86							
Feb-86							
Mar-86	7.54	0.153	0.026	0.220	2.220	2541	505.0

WELL NO.: 4

PARAMETER (mg/l)

DATE	pH	Copper	Zinc	Nickel	Boron	TDS	Cloride
Jan-84	6.53	0.520	3.153	0.362	2.350	4760.00	1129.0
Feb-84	6.43	0.220	0.270	0.250	2.600	6300.00	1511.0
Mar-84	6.32	0.553	0.570	0.280	3.600	6420.00	1410.0
Apr-84	6.35	0.765	0.822	0.320	3.350	6200.00	1457.0
May-84							
Jun-84	6.41	0.245	0.336	0.222	4.060	6510.00	1434.0
Jul-84	6.34	0.550	0.378	0.292	4.420	6480.00	1312.0
Aug-84	6.45	0.189	0.183	0.262	2.910	14000.00	1373.0
Sep-84	6.54	0.222	0.409	0.230	2.290	5920.00	1309.0
Oct-84							
Nov-84	6.55	0.434	0.117	0.160	3.350	6030.00	1481.0
Dec-84	6.47	0.652	0.386	0.310	3.290	6400.00	1363.0
Jan-85	6.11	0.132	0.572	0.310	2.710	5500.00	1297.0
Feb-85	6.55	0.341	0.250	0.440	2.830	6330.00	1531.0
Mar-85	5.70	0.237	0.230	0.220	3.930	6672.00	1540.0
Apr-85	5.60	0.127	0.379	0.270	3.230	5806.00	1394.0
May-85	5.60	0.170	0.269	0.310	3.290	6200.00	1150.0
Jun-85	6.27	2.892	0.121	0.350	3.020	6322.00	1273.0
Jul-85	6.28	0.121	0.216	0.290	3.370	6350.00	1233.0
Aug-85	6.21	0.124	0.319	0.410	3.430	6150.00	1000.0
Sep-85	6.26	0.116	0.131	0.400	2.820	5666.00	1264.0
Oct-85	6.40	0.252	0.240	0.330	3.070	6101.00	1444.0
Nov-85	6.40	195.000	39.600	174.000	2.650	8424.00	1525.0
Dec-85	6.43	0.747	3.940	0.000	2.210	4700.00	1191.0
Jan-86	6.47	0.334	0.279	3.400	3.020	6577.00	1523.0
Feb-86	6.60	1.240	4.560	2.510	3.200	5063.00	1341.0
Mar-86	6.76	0.282	0.222	0.410	3.360	6396.00	1450.0

WELL NO.: 4-A

PARAMETER
(mg/l)

DATE	pH	Copper	Zinc	Nickel	Boron	TDS	Chloride
Jan-84	2.93	742.000	28.000	432.000	[illegible]	15000.00	[illegible]
Feb-84	3.08	432.000	23.300	242.000	1.200	15000.00	1359.0
Mar-84	3.13	349.000	19.200	237.000	2.740	11000.00	[illegible]
Apr-84	3.17	458.000	27.300	299.000	1.340	11000.00	[illegible]
May-84							
Jun-84	3.12	396.000	25.000	256.000	2.440	10000.00	968.0
Jul-84	3.05	535.000	24.300	254.000	4.000	14000.00	1725.0
Aug-84	2.91	593.000	31.500	345.000	2.820	14000.00	1752.0
Sep-84	3.01	431.000	36.900	248.000	2.540	13000.00	1852.0
Oct-84	2.97	623.000	32.700	367.000	5.040	13000.00	1308.0
Nov-84	2.91	1278.000	38.900	780.000	3.040	15000.00	1506.0
Dec-84	3.11	167.000	22.400	118.000	2.620	8520.00	1135.0
Jan-85	3.04	277.000	15.400	180.000	2.210	9670.00	1506.0
Feb-85	3.21	298.000	24.700	203.000	3.340	11000.00	1253.0
Mar-85	2.55	200.000	10.500	130.000	2.200	8605.00	1159.0
Apr-85	2.27	273.000	22.600	184.000	1.360	7640.00	1662.0
May-85	2.25	751.000	0.267	496.000	1.500	12000.00	940.0
Jun-85	2.92	1456.000	52.900	1190.000	3.000	25000.00	1992.0
Jul-85	2.43	619.000	32.400	590.000	3.700	66000.00	1467.0
Aug-85	2.92	230.000	22.700	164.000	2.080	8360.00	1027.0
Sep-85	2.86	1438.000	46.500	960.000	9.660	100000.00	665.0
Oct-85	3.80	114.000	13.900	90.000	3.840	8580.00	1722.0
Nov-85	3.29	235.000	22.000	142.000	2.580	6370.00	[illegible]
Dec-85	3.24	214.000	19.100	146.000	2.190	9300.00	1975.0
Jan-86	3.53	241.000	17.200	184.000	2.550	10000.00	1549.0
Feb-86							
Mar-86	4.14	252.000	27.800	189.000	2.010	8740.00	1245.0

WELL NO.: 5

DATE	pH	Copper	Zinc	Nickel	Boron	TDS	Chloride
				PARAMETER (mg/l)			
Jan-84	7.02	0.500	0.064	[illegible]	0.400	2350.00	[illegible]
Feb-84	6.91	0.443	0.046	0.260	[illegible]	2310.00	[illegible]
Mar-84	[illegible]	[illegible]	[illegible]	0.050	[illegible]	[illegible]	[illegible]
Apr-84	6.80	[illegible]	[illegible]	[illegible]	0.580	[illegible]	[illegible]
May-84							
Jun-84	6.31	0.200	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Jul-84	6.75	[illegible]	0.111	[illegible]	0.520	2780.00	322.0
Aug-84	[illegible]	0.333	[illegible]	0.291	<1.0	2912.00	333.0
Sep-84	6.82	0.032	0.038	<.01	0.110	3796.00	420.0
Oct-84	6.80	0.487	0.197	[illegible]	0.020	2720.00	[illegible]
Nov-84	4.25	0.617	0.083	0.390	2.100	[illegible]	593.0
Dec-84	6.66	[illegible]	0.053	0.120	0.260	2500.00	642.0
Jan-85	5.73	0.043	0.074	0.100	0.240	2275.00	1085.0
Feb-85	6.86	0.108	0.067	0.210	0.270	2928.00	375.0
Mar-85	6.46	0.114	0.040	0.110	0.090	2936.00	1428.0
Apr-85	5.98	0.033	0.038	0.090	<.01	[illegible]	536.0
May-85	5.99	0.045	0.033	0.130	0.570	3043.00	500.0
Jun-85	6.60	[illegible]	0.063	0.120	0.590	2888.00	367.0
Jul-85	6.62	0.040	0.045	0.100	0.560	2986.00	362.0
Aug-85	6.50	0.059	0.046	0.850	[illegible]	3058.00	[illegible]
Sep-85	6.63	0.176	0.064	0.260	0.090	3210.00	367.0
Oct-85	6.69	0.044	0.012	[illegible]	0.073	2954.00	400.0
Nov-85	6.59	<.05	0.012	[illegible]	0.840	2979.00	760.0
Dec-85	6.52	0.038	0.660	0.160	0.500	2963.00	[illegible]
Jan-86							
Feb-86							
Mar-86	7.20	1.020	[illegible]	0.240	[illegible]	[illegible]	[illegible]

CHEMETCO GROUNDWATER ASSESSMENT 05-Jun-86

WELL NO.: S-W

PARAMETER

(mg/l)

DATE	pH	Copper	Zinc	Nickel	Boron	TDS	Cloride
Jan-84	2.64	828.0	46.700	596.000	3.550	25000.0	3064.0
Feb-84	2.76	443.0	65.800	296.000	2.400	22000.0	[illegible]
Mar-84	2.82	232.0	74.600	288.000	5.440	20000.0	[illegible]
Apr-84	2.96	237.0	94.900	315.000	5.450	15000.0	2397.0
May-84							
Jun-84	5.90	[illegible]	53.700	0.250	5.545	10000.0	[illegible]
Jul-84	2.57	566.0	23.500	410.000	5.080	26000.0	3628.0
Aug-84	2.53	796.0	25.500	504.000	5.430	26000.0	4143.0
Sep-84	2.74	614.0	24.300	466.000	3.360	26000.0	5901.0
Oct-84	2.77	515.0	29.500	429.000	0.690	30000.0	6172.0
Nov-84	2.5[illegible]	314.0	0.265	311.000	12.800	60000.0	5728.0
Dec-84	2.50	257.0	12.800	221.000	6.420	28000.0	6568.0
Jan-85	2.82	145.0	7.800	122.000	4.840	5560.0	7062.0
Feb-85	2.80	303.0	9.200	256.000	4.780	35000.0	8740.0
Mar-85	2.75	269.0	33.700	160.000	0.079	2882.0	5617.0
Apr-85	2.38	170.0	69.200	160.000	7.380	24000.0	6187.0
May-85	2.12	275.0	28.000	259.000	7.200	30000.0	[illegible]
Jun-85	3.03	118.0	11.100	138.000	9.040	31000.0	5339.0
Jul-85	2.78	440.0	28.500	413.000	13.500	27000.0	3804.0
Aug-85	2.73	339.0	22.700	286.000	11.200	35000.0	3950.0
Sep-85	2.35	800.0	43.400	65.400	6.940	64000.0	7056.0
Oct-85	4.18	116.0	13.700	106.000	15.500	25000.0	7497.0
Nov-85	3.76	153.0	21.000	120.000	14.300	17000.0	4458.0
Dec-85	3.40	159.0	23.200	140.000	11.700	16000.0	3952.0
Jan-86							
Feb-86							
Mar-86	3.70	255.0	22.500	184.000	13.200	14000.0	3992.0

CHEMETCO GROUNDWATER ASSESSMENT 05-Jun-86

WELL NO.: [illegible]

PARAMETER (MG/L)

DATE	pH	Copper	Zinc	Nickel	Boron	TDS	Cloride
Jan-84	6.95	0.015	0.032	0.010	<.10	750.0	37.0
Feb-84	6.90	0.039	0.056	0.030	<.10	304.0	46.0
Mar-84	7.86	0.025	0.031	0.480	[illegible]	902.0	41.[illegible]
Apr-84	6.[illegible]	0.048	0.047	0.030	.10	908.0	45.[illegible]
May-84							
Jun-84	6.99	0.021	0.049	<.01	[illegible]	1004.0	46.[illegible]
Jul-84	6.91	0.285	0.054	0.210	0.330	1004.0	44.[illegible]
Aug-84	7.05	0.253	0.012	<.01	1.600	1034.0	41.[illegible]
Sep-84	6.98	0.015	0.019	<.01	0.060	1946.0	45.7
Oct-84	6.93	0.409	0.046	0.330	0.030	970.0	54.3
Nov-84	7.16	0.361	0.028	0.300	<.01	1056.0	99.3
Dec-84	6.99	0.003	0.087	0.040	<.01	1316.0	74.0
Jan-85	6.89	0.003	0.018	0.060	<.01	1288.0	235.0
Feb-85	6.91	2.070	0.073	1.330	<.01	1250.0	237.0
Mar-85	6.69	0.0[illegible]	0.020	0.050	<.01	1342.0	188.0
Apr-85	6.39	0.059	0.017	0.050	<.01	1484.0	125.0
May-85	7.09	0.031	0.021	0.090	<.01	1674.0	85.6
Jun-85	6.75	0.013	0.060	0.050	0.370	1378.0	54.8
Jul-85	6.68	0.026	0.018	0.090	0.300	1450.0	70.4
Aug-85	6.67	0.083	0.027	0.580	<.01	1424.0	30.2
Sep-85	6.75	0.234	0.022	0.190	2.220	1548.[illegible]	58.7
Oct-85	6.84	0.036	0.017	0.050	<.01	1353.0	54.[illegible]
Nov-85	6.80	<.05	<.05	0.110	<.01	1502.0	42.8
Dec-85	6.77	0.006	0.006	0.070	0.490	1339.0	49.[illegible]
Jan-86	6.90	0.064	0.011	0.150	<.01	1388.[illegible]	45.[illegible]
Feb-86	6.82	0.025	0.073	0.030	0.050	1530.0	42.5
Mar-86	6.92	0.016	0.015	0.080	0.050	172[illegible]	[illegible]

CHEMETCO GROUNDWATER ASSESSMENT 05-Jun-86

WELL NO.: 7-A

PARAMETER

DATE	pH	Copper	Zinc	Nickel	Boron	TDS	Chloride
Jan-84	2.64	4380.000	110.000	2550.000	1.850	39000.0	830.0
Feb-84	2.73	2720.000	78.200	1520.000	[illegible]	33000.0	914.0
Mar-84	5.53	0.418	0.575	0.450	1.410	3740.0	129.0
Apr-84	3.70	134.000	5.500	127.000	1.750	2506.0	[illegible]
May-84							
Jun-84	2.90	1470.000	46.300	943.000	2.750	21000.0	[illegible]
Jul-84	2.63	2487.000	63.000	1390.000	2.450	38000.0	944.0
Aug-84	2.51	5660.000	122.000	3720.000	1.480	25000.0	[illegible]
Sep-84	3.01	2194.000	51.300	1350.000	2.300	19000.0	[illegible]
Oct-84	2.68	2875.000	64.300	1990.000	0.190	49000.0	514.0
Nov-84	2.74	1898.000	35.000	1210.000	5.940	34000.0	958.0
Dec-84	2.75	1420.000	28.500	960.000	2.200	27000.0	1357.0
Jan-85	2.76	1698.000	34.300	1120.000	3.900	29000.0	1481.0
Feb-85	2.67	2277.000	42.100	1480.000	5.560	52000.0	1195.0
Mar-85	2.86	798.000	18.100	540.000	3.300	17000.0	638.0
Apr-85	2.93	434.000	11.400	285.000	[illegible].560	22000.0	526.0
May-85	2.22	1680.000	35.000	1250.000	3.920	23000.0	560.0
Jun-85	2.72	2095.000	48.200	1700.000	2.900	26000.0	[illegible]
Jul-85	3.29	206.000	6.200	150.000	4.300	8075.0	494.0
Aug-85	2.93	550.000	13.600	415.000	5.180	12000.0	[illegible]
Sep-85	2.57	1974.000	39.600	0.870	2.760	57000.0	635.0
Oct-85	2.57	3135.000	67.600	2350.000	4.400	53000.0	542.0
Nov-85	3.82	177.000	6.400	110.000	2.720	3844.0	215.0
Dec-85	3.93	150.000	6.200	107.000	[illegible].570	4975.0	[illegible]
Jan-86	3.18	1050.000	27.700	360.000	3.400	18000.0	[illegible]
Feb-86	4.14	144.000	5.020	117.000	2.580	4304.0	[illegible]
Mar-86	3.26	728.000	17.400	535.000	3.590	15000.0	[illegible]

CHEMETCO GROUNDWATER ASSESSMENT 05-Jun-86

WELL NO. [illegible]

PARAMETER
(mg/l)

DATE	pH	Copper	Zinc	Nickel	Boron	TDS	Cloride
Jan-84	[illegible]	[illegible]	0.080	0.028	2.300	4350.0	804.0
Feb-84	7.24	[illegible]	0.036	0.112	2.400	4400.0	759.0
Mar-84	[illegible]	[illegible]	1.440	0.020	3.680	14000.0	730.0
Apr-84	[illegible]	[illegible]	0.083	0.040	0.040	4423.0	750.0
May-84							
Jun-84	7.04	[illegible]	[illegible]	0.100	[illegible]	4296.0	760.0
Jul-84	[illegible]	[illegible]	0.066	0.580	4.700	4474.0	769.0
Aug-84	[illegible]	0.198	0.011	[illegible]	3.510	4292.0	735.0
Sep-84	7.45	0.034	0.037	0.020	3.800	418.0	726.0
Oct-84							
Nov-84	[illegible]	[illegible]	0.107	[illegible]	8.500	3948.0	935.0
Dec-84	7.22	0.011	0.042	0.110	4.340	3820.0	790.0
Jan-85	6.91	[illegible]	0.294	0.220	4.370	3898.0	1037.0
Feb-85	7.13	1.450	3.540	0.140	3.480	3828.0	691.0
Mar-85	6.92	0.161	0.170	0.120	3.860	3884.0	1731.0
Apr-85	6.38	0.025	0.033	0.060	3.770	4134.0	[illegible]
May-85	6.46	0.035	0.054	0.160	3.790	4084.0	519.0
Jun-85	[illegible]	0.029	0.027	0.090	4.000	4250.0	1064.0
Jul-85	6.98	0.032	0.045	0.100	4.260	4126.0	745.0
Aug-85	7.07	0.333	0.594	0.530	3.850	4252.0	951.0
Sep-85	7.08	15.000	34.000	0.870	4.790	3682.0	850.0
Oct-85	7.14	0.072	0.096	0.100	3.830	4310.0	674.0
Nov-85	7.17	<.05	0.125	0.110	3.340	3923.0	1203.0
Dec-85	7.03	<.05	0.063	0.060	2.240	4329.0	1545.0
Jan-86	7.09	0.132	0.055	0.160	3.330	4024.0	795.0
Feb-86	7.05	0.149	0.376	0.210	3.660	4233.0	840.0
Mar-86							

WELL NO.: B-4

PARAMETER
(mg/l)

DATE	pH	Copper	Zinc	Nickel	Boron	TDS	Chloride
Jan-84							
Feb-84							
Mar-84							
Apr-84							
May-84							
Jun-84							
Jul-84							
Aug-84							
Sep-84							
Oct-84							
Nov-84							
Dec-84							
Jan-85	7.35	0.115	0.042	0.[illegible]10	4.720	4989.0	1333.0
Feb-85	7.48	0.280	0.073	0.340	2.700	3214.0	790.0
Mar-85	6.68	0.474	0.140	0.230	1.550	2272.0	1350.0
Apr-85	5.25	0.025	0.014	0.020	1.040	2120.0	934.0
May-85	8.21	0.046	0.020	0.040	1.920	2252.0	621.0
Jun-85	9.15	0.025	0.016	0.050	1.560	2334.0	573.0
Jul-85	9.33	0.044	0.013	0.080	4.500	2272.0	538.0
Aug-85	7.91	0.042	0.037	1.010	1.500	2328.0	919.0
Sep-85	8.47	0.154	0.014	0.160	1.760	2460.0	504.0
Oct-85	9.58	0.092	0.017	0.050	1.600	3244.0	917.0
Nov-85	6.86	0.009	0.174	0.190	2.200	6685.0	2419.0
Dec-85	6.64	0.005	0.334	0.380	1.490	8570.0	3354.0
Jan-86	7.29	1.500	0.239	1.310	2.040	8949.0	2921.0
Feb-86	6.31	0.279	1.600	1.210	3.030	968.0	3626.0
Mar-86	6.49	0.382	2.130	1.620	3.420	7848.0	2730.0

CHEMETCO GROUNDWATER ASSESSMENT 03-Jun-86

WELL NO.: 9

PARAMETER
(mg/l)

DATE	pH	Copper	Zinc	Nickel	Boron	TDS	Chloride
Jan-84	7.11	0.016	0.012	<.01	.10	[illegible]	[illegible]
Feb-84	7.21	0.010	0.010	0.040	.10	880.0	[illegible]
Mar-84	6.94	0.024	0.004	0.040	0.310	[illegible]	[illegible]
Apr-84	6.86	[illegible]	0.172	[illegible]	[illegible]	[illegible]	[illegible]
May-84							
Jun-84	6.97	0.294	0.168	0.250	[illegible]	[illegible]	[illegible]
Jul-84	6.96	0.023	0.014	0.030	[illegible]	[illegible]	[illegible]
Aug-84	5.42	0.009	0.008	[illegible]	[illegible]	[illegible]	[illegible]
Sep-84	6.96	0.012	0.036	0.010	0.430	1190.0	159.0
Oct-84	6.5	0.011	0.008	<.01	0.300	1142.0	148.0
Nov-84	7.31	0.093	0.025	0.080	0.540	1312.0	232.0
Dec-84	5.87	0.002	0.017	0.050	<.01	[illegible]	[illegible]
Jan-85	6.77	0.013	0.016	0.050	0.690	1087.0	212.0
Feb-85	6.96	0.264	0.032	0.280	0.310	1128.0	153.0
Mar-85	6.58	0.003	0.110	0.030	0.270	1242.0	177.0
Apr-85	5.87	0.041	0.002	0.020	0.210	[illegible]	169.0
May-85	6.44	0.069	0.038	0.090	0.500	1212.0	164.0
Jun-85	6.80	0.134	0.055	0.150	<.01	1295.0	[illegible]
Jul-85	6.69	0.022	0.016	0.050	0.230	1355.0	167.0
Aug-85	6.62	0.037	0.127	2.020	0.330	1336.0	245.0
Sep-85	6.69	0.067	0.025	0.120	0.280	9474.0	[illegible]
Oct-85	6.86	0.022	0.007	0.040	<.01	1278.0	[illegible]
Nov-85	6.72	<.05	0.015	0.080	.01	1376.0	124.0
Dec-85	6.72	<.05	0.056	0.090	0.120	1296.0	[illegible]
Jan-86	6.79	0.017	<.05	0.070	0.410	1253.0	[illegible]
Feb-86	6.90	0.019	0.094	0.080	0.210	1424.0	[illegible]
Mar-86	7.18	0.018	0.016	0.150	0.190	1362.0	14.5

CHEMETCO GROUNDWATER ASSESSMENT 05-Jun-86

WELL NO.: 10

PARAMETER
(mg/l)

DATE	pH	Copper	Zinc	Nickel	Boron	TDS	Cloride
Jan-84	7.02	0.010	0.038	<.01	<.10	516.0	<5.0
Feb-84	7.00	0.009	0.012	<.01	<.10	772.0	5.0
Mar-84	6.93	0.005	0.006	0.010	0.470	560.0	29.0
Apr-84	6.93	0.172	0.029	0.030	.10	632.0	[illegible]
May-84							
Jun-84	6.95	0.106	0.160	0.040	0.750	562.0	<5.0
Jul-84	7.15	0.005	0.019	.01	3.050	554.0	5.0
Aug-84	7.07	0.009	0.010	0.030	<1.0	534.0	<1.0
Sep-84	7.36	0.008	0.015	<.01	0.030	538.0	<1.0
Oct-84	6.96	0.007	0.003	0.020	1.800	548.0	9.5
Nov-84	6.72	0.459	0.066	2.460	1.000	540.0	53.2
Dec-84	6.90	0.001	0.014	0.050	0.410	632.0	494.0
Jan-85	6.91	0.010	0.021	0.140	0.040	550.0	494.0
Feb-85	6.93	0.066	0.030	0.090	0.250	562.0	59.0
Mar-85	6.45	0.005	0.030	0.010	0.430	560.0	17.5
Apr-85	6.13	0.030	0.015	0.040	0.530	536.0	21.0
May-85	6.46	0.023	0.039	0.110	0.240	491.0	10.0
Jun-85	6.84	0.023	0.013	0.050	0.410	546.0	15.4
Jul-85	6.33	0.014	0.011	0.030	0.440	480.0	10.5
Aug-85	6.64	0.033	0.075	2.170	0.900	502.0	38.5
Sep-85	6.93	0.377	0.169	0.110	0.730	372.0	15.9
Oct-85	6.36	0.633	0.010	0.290	0.120	516.0	8.1
Nov-85	6.80	<.05	<.05	0.090	<.01	555.0	28.4
Dec-85	6.90	<.05	0.156	<.05	<.01	528.0	20.2
Jan-86	6.85	0.014	0.016	2.400	0.190	528.0	[illegible]
Feb-86	7.06	<.05	0.064	0.050	0.250	533.0	<.05
Mar-86	7.28	0.009	0.020	<.05	0.230	525.0	3.5

CHEMETCO GROUNDWATER ASSESSMENT 05-Jun-86

WELL NO. [illegible]

PARAMETER
(mg/l)

DATE	pH	Copper	Zinc	Nickel	Boron	TDS	Chloride
Jan-84	7.05	0.286	0.003	0.170	[illegible]	328.0	[illegible]
Feb-84	7.25	0.004	0.004	[illegible]	0.100	[illegible]	[illegible]
Mar-84	7.20	0.002	0.001	0.010	0.390	426.0	[illegible]
Apr-84	7.15	0.017	0.029	<.01	[illegible]	[illegible]	[illegible]
May-84							
Jun-84	7.21	0.369	0.010	0.250	0.300	[illegible]	[illegible]
Jul-84	7.27	0.002	0.014	<.01	2.190	329.0	[illegible]
Aug-84	7.31	0.006	0.003	0.020	[illegible]	344.0	[illegible]
Sep-84	7.39	0.005	<.01	<.01	0.310	334.0	[illegible]
Oct-84	7.31	0.026	0.032	0.330	0.520	336.0	5.4
Nov-84	7.69	0.040	0.017	0.020	0.460	292.0	[illegible]
Dec-84	7.40	0.001	0.009	0.060	0.350	328.0	54.3
Jan-85	7.04	0.018	0.012	0.020	0.040	324.0	119.0
Feb-85	7.25	0.016	0.023	0.070	0.210	17000.0	85.0
Mar-85	6.77	0.001	[illegible]	0.020	0.150	320.0	[illegible]
Apr-85	6.46	0.008	0.022	0.020	0.020	302.0	[illegible]
May-85	6.71	0.150	0.017	0.120	0.120	[illegible]	[illegible]
Jun-85	7.22	0.042	0.058	0.060	<.01	204.0	[illegible]
Jul-85	7.35	0.339	0.383	0.310	0.370	254.0	10.0
Aug-85	7.16	0.100	0.103	1.130	0.030	290.0	15.9
Sep-85	7.26	0.008	0.016	0.050	0.040	219.0	3.2
Oct-85	7.35	0.156	0.024	0.130	<.01	611.0	<1.0
Nov-85	7.23	<.05	<.05	0.060	<.01	[illegible]	[illegible]
Dec-85	7.07	<.05	0.122	0.120	<.01	214.0	[illegible]
Jan-86	7.18	0.025	0.054	0.050	0.230	306.0	[illegible]
Feb-86	7.32	<.05	0.019	<.01	0.090	296.0	[illegible]
Mar-86	7.57	0.007	0.021	<.05	[illegible]	[illegible]	[illegible]

CHEMETCO GROUNDWATER ASSESSMENT 01-Jan-80

WELL NO.: [illegible]

PARAMETER
(mg/l)

DATE	pH	Copper	Zinc	Nickel	Boron	TDS	Chloride
Jan-84							
Feb-84							
Mar-84							
Apr-84							
May-84							
Jun-84							
Jul-84							
Aug-84							
Sep-84							
Oct-84							
Nov-84							
Dec-84							
Jan-85	6.75	1.050	0.154	1.110	1.000	2050.2	494.0
Feb-85	7.02	0.037	0.032	0.090	0.260	2056.0	148.0
Mar-85	6.36	0.003	0.020	0.040	0.020	2184.0	60.5
Apr-85	6.83	0.022	0.024	0.050	0.220	2212.0	42.0
May-85	6.16	929.000	155.000	1110.000	0.170	2160.0	12.7
Jun-85	6.30	0.114	0.092	0.300	0.910	2115.0	43.3
Jul-85	6.55	0.095	0.012	0.100	0.290	2118.0	24.7
Aug-85	6.67	0.006	0.015	0.270	0.940	2122.0	47.2
Sep-85	6.84	0.247	0.026	0.240	0.370	2050.0	17.8
Oct-85	6.96	0.052	0.009	0.000	0.010	1920.0	33.9
Nov-85	6.64	<.05	0.010	0.090	0.320	2225.0	38.4
Dec-85	6.67	<.05	0.020	0.070	<.01	1919.0	32.9
Jan-86	6.75	1.050	0.154	1.110	1.000	2050.0	494.0
Feb-86	7.02	0.037	0.032	0.090	0.260	2056.0	140.0
Mar-86	6.26	0.005	0.020	0.040	0.020	2134.0	60.6

CHEMETCO GROUNDWATER ASSESSMENT 05-Jun-86

WELL NO. 12

PARAMETER
mg/L

DATE	pH	Copper	Zinc	Nickel	Boron	TDS	Cloride
Jan-84							
Feb-84							
Mar-84							
Apr-84	3.47	2960.000	49.700	1650.000	4.240	35000	907.0
May-84							
Jun-84	3.39	2320.000	58.400	1379.000	6.770	35000	735.0
Jul-84	3.30	2147.000	63.300	1170.000	5.360	31000	669.0
Aug-84	3.96	2260.000	59.000	1240.000	1.490	25000	544.0
Sep-84	3.75	1604.000	67.800	1120.000	0.260	19000	499.0
Oct-84	3.38	1150.000	45.200	590.000	1.440	15000	888.0
Nov-84	3.40	1392.000	44.300	350.000	3.780	18000	928.0
Dec-84	3.31	1380.000	46.100	300.000	2.180	17000	740.0
Jan-85	3.62	1187.000	44.100	728.000	0.450	18000	651.0
Feb-85	3.24	115.000	42.800	66.600	0.500	318	622.0
Mar-85	3.09	1180.000	40.300	720.000	3.340	15000	857.0
Apr-85	2.63	1001.000	31.500	580.000	.01	16000	540.0
May-85	3.05	883.000	27.900	521.000	1.040	14000	587.0
Jun-85	3.48	624.000	23.100	410.000	1.400	11000	660.0
Jul-85	3.38	38.600	13.700	234.000	1.320	8222	435.0
Aug-85	3.22	283.000	12.100	1.940	3.000	6368	508.0
Sep-85	3.12	264.000	14.000	157.000	1.710	5606	401.0
Oct-85							
Nov-85	3.30	265.000	14.000	133.000	1.880	5260	578.0
Dec-85	3.11	335.000	16.300	157.000	0.860	6900	466.0
Jan-86	3.19	221.000	13.400	211.000	1.780	6984	453.0
Feb-86	3.43	287.000	13.800	167.700	1.370	5260	440.0
Mar-86	3.37	194.000	10.200	120.000	1.800	5647	490.0

CHEMETCO GROUNDWATER ASSESSMENT 01-Jan-80

WELL NO.: 13

PARAMETER
mg/L

DATE	pH	Copper	Zinc	Nickel	Boron	TDS	Cloride
Jan-84							
Feb-84							
Mar-84							
Apr-84	6.86	0.557	0.017	0.290	<.1	987	<5
May-84							
Jun-84	6.66	0.625	0.028	0.210	0.430	1022	.5
Jul-84	6.56	2.390	0.296	1.722	1.510	954	<5
Aug-84	6.95	0.052	0.007	0.020	<1.0	1005	.1
Sep-84	6.95	0.024	0.029	<0.01	0.140	932	<1
Oct-84	6.80	223.260	0.104	1.420	0.040	985	4.4
Nov-84	6.67	0.025	0.020	0.000	0.590	848	1.6
Dec-84	6.80	0.011	0.029	0.090	<.01	963	444.0
Jan-85	6.64	1.930	0.142	0.940	0.020	924	1136.0
Feb-85	6.84	0.025	0.040	0.100	0.010	1032	345.0
Mar-85	6.36	0.510	0.040	0.320	<.01	1024	21.0
Apr-85	5.96	0.016	0.029	0.060	0.190	1256	36.2
May-85	6.21	0.043	0.039	0.050	<.01	1130	22.0
Jun-85	6.65	0.012	0.009	0.060	<.01	1124	23.0
Jul-85	6.64	0.031	0.003	0.050	<.01	1096	16.4
Aug-85	6.50	0.158	0.053	1.510	1.300	916	20.1
Sep-85	6.72	0.066	0.013	0.020	<.01	928	35.7
Oct-85	6.72	0.761	0.015	0.610	<.01	1002	4.1
Nov-85	6.80	0.406	0.330	0.200	0.080	941	31.4
Dec-85	6.62	<.05	0.145	0.050	0.090	979	25.9
Jan-86	6.97	0.043	0.191	0.070	<.01	892	7.4
Feb-86	6.87	0.029	0.024	0.100	0.130	962	<.05
Mar-86	7.01	0.040	0.022	0.070	0.190	916	3.5

CHEMETCO GROUNDWATER ASSESSMENT 05-Jun-86

WELL NO.: 14

PARAMETER
mg/L

DATE	pH	Copper	Zinc	Nickel	Boron	TDS	Chloride
Jan-84							
Feb-84							
Mar-84							
Apr-84	4.52	1960.000	153.000	1100.000	1.190	[illegible]	[illegible]
May-84							
Jun-84	4.32	3540.000	245.000	2150.000	7.010	22000	[illegible]
Jul-84	4.42	5850.000	309.000	2390.000	17.220	45000	[illegible]
Aug-84	3.99	4340.000	264.000	3220.000	1.000	50000	172.0
Sep-84	4.11	6300.000	276.000	3530.000	1.380	52000	242.0
Oct-84		4920.000	2150.000	3080.000	0.170		
Nov-84	4.32	3720.000	145.000	2170.000	5.580	31000	735.0
Dec-84	4.09	3600.000	147.000	2060.000	6.200	30000	514.0
Jan-85	4.26	3156.000	109.000	1530.000	4.04	22000	527.0
Feb-85	4.28	2773.000	97.300	1350.000	1.400	17000	579.0
Mar-85	3.98	2420.000	69.500	1100.000	1.780	19000	527.0
Apr-85	3.51	3159.000	77.900	1330.000	0.400	22000	607.0
May-85	3.51	3178.000	71.100	1420.000	2.000	23000	591.0
Jun-85	4.03	2295.000	74.400	1350.000	2.220	22000	658.0
Jul-85	3.90	1950.000	61.000	1100.000	2.440	20000	685.0
Aug-85	3.39	1755.000	67.200	1040.000	2.620	20000	770.0
Sep-85	4.02	1844.000	67.900	1120.000	9.420	23000	697.0
Oct-85	3.97	2370.000	84.000	1647.000	0.960	25000	735.0
Nov-85	4.14	2763.000	87.000	1200.000	2.220	19000	907.0
Dec-85	3.86	2788.000	79.500	1235.000	0.300	21000	456.0
Jan-86	4.24	2380.000	66.000	1110.000	2.400	22000	8260.0
Feb-86	4.24	2270.000	56.800	915.000	2.560	20000	745.0
Mar-86	4.13	1850.000	750.000	57.300	3.000	19000	775.0

CHEMETCO GROUNDWATER ASSESSMENT 05-Jun-86

WELL NO.: 15

PARAMETER
mg/L

DATE	pH	Copper	Zinc	Nickel	Boron	TDS	Cloride
Jan-84							
Feb-84							
Mar-84							
Apr-84	[illegible]	546.000	9.300	583.000	[illegible]	[illegible]	[illegible]
May-84	4.79	920.000	9.500	598.000	1.050	12000	[illegible]
Jun-84	[illegible]	1065.000	10.000	[illegible]	[illegible]	14000	[illegible]
Jul-84	4.2[illegible]	853.000	13.700	364.000	1.450	17000	154.0
Aug-84	3.96	2231.000	21.300	1090.000	1.130	24000	163.0
Sep-84							
Oct-84							
Nov-84	3.49	2430.000	20.600	1250.000	1.880	24000	[illegible]
Dec-84	3.50	2180.000	19.900	1130.000	1.360	25000	114.0
Jan-85	3.42	2079.000	20.300	1050.000	0.840	24000	194.0
Feb-85	3.53	1961.000	20.700	1000.000	1.300	22000	126.0
Mar-85	5.91	1950.000	18.000	950.000	0.560	23000	114.0
Apr-85	3.02	1783.000	16.200	820.000	1.700	20000	96.8
May-85	2.86	1557.000	15.200	712.000	1.420	19000	[illegible]
Jun-85	3.34	1672.000	19.800	950.000	1.380	19000	90.2
Jul-85	3.22	1456.000	13.600	730.000	1.520	20000	74.0
Aug-85	3.17	1561.000	17.700	720.000	2.640	21000	80.[illegible]
Sep-85	3.26	1675.000	15.600	742.000	2.810	32000	66.0
Oct-85	3.70	1370.000	13.900	672.000	0.680	18000	113.0
Nov-85	3.26	2133.000	24.500	1170.000	1.900	25000	99.2
Dec-85	3.26	1790.000	25.400	1005.000	0.700	27000	126.0
Jan-86	3.43	1710.000	22.900	1060.000	0.480	25000	153.0
Feb-86	3.55	1800.000	20.400	1040.000	1.540	23000	120.0
Mar-86	3.43	1580.000	960.000	17.700	1.820	20000	112.0

WELL NO.: 16

PARAMETER
mg/L

DATE	pH	Copper	Zinc	Nickel	Boron	TDS	Cloride
Jan-84							
Feb-84							
Mar-84							
Apr-84							
May-84	[illegible]	[illegible]	[illegible]	46.500	0.120	[illegible]	[illegible]
Jun-84	5.29	970.000	77.000	2020.000	2.450	22000	[illegible]
Jul-84	5.24	946.000	74.500	1760.000	1.760	22000	946.0
Aug-84	5.64	239.000	66.700	2060.000	2.200	21000	47.8
Sep-84	5.97	178.000	68.300	2070.000	0.800	18000	55.6
Oct-84	6.11	294.000	69.900	2350.000	0.030	23000	98.7
Nov-84	6.03	40.200	50.900	2070.000	0.550	20000	469.0
Dec-84	6.08	24.700	59.700	2230.000	0.250	23000	395.0
Jan-85	5.83	21.000	55.900	2030.000	0.060	21000	499.0
Feb-85	5.96	24.900	58.300	1940.000	0.260	20000	543.0
Mar-85	5.76	15.400	47.100	1800.000	0.520	19000	125.0
Apr-85	5.40	11.800	37.100	1580.000	<.01	15000	1027.0
May-85	5.48	14.100	41.600	1620.000	0.48	15000	52.3
Jun-85	5.95	22.600	41.300	2040.000	0.380	18000	26.2
Jul-85	5.77	12.300	44.800	1800.000	0.400	17000	5.9
Aug-85	5.71	13.100	39.600	1360.000	0.600	17000	147.0
Sep-85	5.87	22.700	43.000	1240.000	0.740	17000	22.5
Oct-85	5.84	17.700	45.300	1940.000	<.01	18000	24.3
Nov-85	5.83	22.500	48.000	1340.000	1.360	17000	53.3
Dec-85	5.85	15.800	46.700	1770.000	1.740	18000	[illegible]
Jan-86	6.12	11.500	43.000	1530.000	0.340	17000	52.0
Feb-86	5.97	16.300	57.700	2180.000	0.400	16000	[illegible]
Mar-86	5.98	13.700	1210.000	39.500	0.520	14000	[illegible]

CHEMETCO GROUNDWATER ASSESSMENT 05-Jun-86

WELL NO.: 17

PARAMETER
mg/L

DATE	pH	Copper	Zinc	Nickel	Boron	TDS	Chloride
Jan-84							
Feb-84							
Mar-84							
Apr-84							
May-84	4.57	1750.000	166.000	1310.000	0.370	[illegible]	[illegible]
Jun-84	4.55	1420.000	1600.000	1136.000	[illegible]	[illegible]	[illegible]
Jul-84	4.38	2038.000	1930.000	201.000	4.330	[illegible]	[illegible]
Aug-84	4.60	1490.000	194.000	1370.000	3.200	20000	[illegible]
Sep-84	4.17	1414.000	250.000	1480.000	0.500	21000	[illegible]
Oct-84	4.62	1008.000	183.000	1280.000	0.040	14000	[illegible]
Nov-84	4.56	1119.000	159.000	1230.000	0.960	[illegible]	[illegible]
Dec-84	4.45	1170.000	170.000	1260.000	0.820	16000	104.0
Jan-85	4.55	1051.000	159.000	1170.000	0.290	15000	[illegible]
Feb-85	4.65	921.000	144.000	990.000	0.300	15000	158.0
Mar-85	4.33	800.000	135.000	950.000	[illegible]	14000	118.0
Apr-85	3.87	965.000	150.000	1120.000	<.01	14000	147.0
May-85	4.14	0.026	0.030	0.070	0.42	15000	[illegible]
Jun-85	4.54	1019.000	202.000	1450.000	0.140	14000	100.0
Jul-85	4.63	580.000	114.000	360.000	0.420	13000	[illegible]
Aug-85	4.55	542.000	135.000	950.000	<.02	13000	131.0
Sep-85	4.88	416.000	193.000	740.000	0.540	13000	50.0
Oct-85	4.94	336.000	112.000	952.000	<.01	13000	152.0
Nov-85	4.96	479.000	125.000	790.000	0.920	12000	116.0
Dec-85	4.82	553.000	139.000	975.000	[illegible]	17000	
Jan-86	5.17	510.000	140.000	1150.000	0.290	13000	[illegible]
Feb-86	5.03	673.000	141.000	970.000	0.330	13000	[illegible]
Mar-86	4.99	655.000	875.000	119.000	0.480	13000	[illegible]

CHEMETCO GROUNDWATER ASSESSMENT 05-Jun-86

WELL NO : 13

PARAMETER
mg/L

DATE	pH	Copper	Zinc	Nickel	Boron	TDS	Cloride
Jan-84							
Feb-84							
Mar-84							
Apr-84							
May-84	6.45	0.543	0.134	0.310	10	3106	[illegible]
Jun-84	6.39	0.059	0.127	0.060	1.040	3336	25.7
Jul-84	6.40	1.050	0.197	0.790	0.810	3370	5.0
Aug-84	6.44	0.126	0.055	0.130	1.000	6256	[illegible]
Sep-84	6.44	0.087	0.068	0.160	0.460	2542	[illegible]
Oct-84	6.28	1.160	0.726	2.690	0.010	3332	91.0
Nov-84	6.37	0.156	0.295	2.830	0.420	3104	[illegible]
Dec-84	6.46	0.002	0.042	0.180	0.620	3224	494.0
Jan-85	6.25	0.034	0.031	0.120	2.990	2982	345.0
Feb-85	6.39	0.050	0.054	0.180	0.270	3054	329.0
Mar-85	2.61	0.601	0.070	0.360	0.170	2908	38.3
Apr-85	5.53	0.022	0.030	0.090	0.610	2966	38.6
May-85	5.79	0.035	0.046	0.130	0.26	2796	26.8
Jun-85	6.22	0.033	0.029	0.140	0.030	17000	43.4
Jul-85	6.21	0.091	0.019	0.140	0.150	1872	39.[illegible]
Aug-85	6.23	0.124	0.201	5.720	0.680	5444	47.0
Sep-85	6.31	0.077	0.045	0.220	0.390	2946	22.7
Oct-85	6.29	0.061	0.026	0.210	0.040	2351	13.7
Nov-85	6.25	.05	0.012	0.150	0.330	2749	70.9
Dec-85	6.24	0.005	0.143	0.190	0.420	2621	40.5
Jan-86	6.47	0.019	0.056	0.140	0.240	2650	16.8
Feb-86	6.57	0.099	0.039	0.200	0.270	2561	1.0
Mar-86	6.61	0.023	0.130	0.025	0.260	2481	2.0

CHEMETCO GROUNDWATER ASSESSMENT 05-Jun-86

WELL NO.: 19

PARAMETER
mg/L

DATE	pH	Copper	Zinc	Nickel	Boron	TDS	Cloride
Jan-84							
Feb-84							
Mar-84							
Apr-84							
May-84	7.01	0.163	0.147	0.170	[illegible]	582	[illegible]
Jun-84	6.90	0.184	0.042	0.110	1.000	564	[illegible]
Jul-84	6.89	0.019					
Aug-84	6.98	0.030	0.052	0.050	<1.0	692	<1.0
Sep-84	7.02	0.021	0.040	0.030	0.420	782	4.4
Oct-84	6.99	1.460	0.069	1.070	1.140	526	17.8
Nov-84	6.88	0.031	0.030	0.160	0.340	595	113.0
Dec-84	7.03	0.040	0.213	0.200	1.790	348	188.0
Jan-85	6.77	0.023	0.016	0.080	0.220	626	138.0
Feb-85	6.95	2.170	0.165	0.990	0.600	618	71.6
Mar-85	6.67	0.348	0.110	0.220	0.030	644	37.1
Apr-85	6.15	0.017	0.032	0.050	0.740	640	79.3
May-85	6.35	0.071	0.236	0.190	2.66	681	19.0
Jun-85	6.89	0.061	0.130	0.150	1.320	552	24.0
Jul-85	6.79	0.024	0.022	0.040	0.170	567	12.0
Aug-85	6.69	0.083	0.143	3.390	0.580	458	21.8
Sep-85	6.97	0.020	0.031	0.050	0.310	602	30.1
Oct-85	6.89	0.019	0.010	0.060	0.010	581	5.6
Nov-85	6.89	<.05	<.05	<.05	0.350	527	37.0
Dec-85	6.84	<.05	0.140	0.080	0.200	574	16.0
Jan-86	6.92	0.020	0.019	0.100	0.120	592	4.?
Feb-86	7.00	0.051	0.027	0.060	0.170	593	.05
Mar-86	7.02	0.029	0.090	0.062	0.690	583	<1.0

CHEMETCO GROUNDWATER ASSESSMENT 05-Jun-86

WELL NO.: 20

PARAMETER
mg/L

DATE	pH	Copper	Zinc	Nickel	Boron	TDS	Chloride
Jan-84							
Feb-84							
Mar-84							
Apr-84							
May-84							
Jun-84							
Jul-84							
Aug-84							
Sep-84							
Oct-84							
Nov-84							
Dec-84							
Jan-85							
Feb-85							
Mar-85							
Apr-85							
May-85							
Jun-85							
Jul-85							
Aug-85							
Sep-85							
Oct-85							
Nov-85							
Dec-85							
Jan-86							
Feb-86							
Mar-86	7.30	0.005	0.080	0.013	0.020	356	[illegible]

CHEMETCO GROUNDWATER ASSESSMENT 05-Jun-86

WELL NO 2

PARAMETER
mg/L

DATE	pH	Copper	Zinc	Nickel	Boron	TDS	Cloride
Jan-84							
Feb-84							
Mar-84							
Apr-84							
May-84							
Jun-84							
Jul-84							
Aug-84							
Sep-84							
Oct-84							
Nov-84							
Dec-84							
Jan-85							
Feb-85							
Mar-85							
Apr-85							
May-85							
Jun-85							
Jul-85							
Aug-85							
Sep-85							
Oct-85							
Nov-85							
Dec-85							
Jan-86							
Feb-86							
Mar-86	[illegible]	.05	0.070	0.022	0.330	[illegible]	[illegible]

APPENDIX B

ZNO

CHEMICAL ANALYSIS

		PERCENT--DRY WEIGHT BASIS						
PARAMETER	SAMPLE1	SAMPLE2	SAMPLE3	SAMPLE4	SAMPLE5	SAMPLE6	SAMPLE7	SAMPLE8
ZINC	18.8	25.4	33.6	27.7	31.6	35.65	29.84	40.61
ARSENIC	0.02	0.09	0.03	0.03	0.09			
ANTIMONY	0.1	0.07	0.05	0.04	0.07	0.087	0.132	0.07
TELLURIUM	0.06	0.07	0.03	0.05	0.06			
SELENIUM	0	0	0	0	0			
TIN	0.68	0.43	0.25	0.42	0.81	1.53	1.39	1.27
IRON	2	1.5	1.58	2	1.68	2.53	2.7	2.12
LEAD	12.4	16.3	6.31	8.68	10.6	14.37	12.82	18.89
SILVER	0.022	0.016	0.022	0.01	0.17			
COPPER	14.5	9.05	7.05	7.81	10.6	9.69	12.39	8.1
NICKEL	0.15	0.22	0.36	0.25	0.16	0.53	0.59	0.38
ALUMINUM	1.3	0.31	0.67	0.79	0.53			

APPENDIX C

CHEMETCO, INC.

ZnO PIT CLOSURE

SAMPLING RESULTS

(EP TOXICITY)

znopit

CHEMETCO, HARTFORD IL
ZNO PIT CLOSURE
SAMPLING RESULTS (EP TOXICITY)

SAMPLE NO.	LEAD (UG/G)	CADMIUM (UG/G)	LAB
1	0.016	0.005	EA *
2	0.1	0.01	EA
3	0.017	0.005	EA
4	0.1	0.01	EA
5	0.014	0.005	EA
6	0.1	0.01	EA
7	0.016	0.005	EA
8	0.023	0.005	EA
9	0.1	0.01	EA
10	0.018	0.005	EA
11	0.021	0.01	EA
12	0.017	0.01	EA
13	1.08	0.005	EA
14	0.21	0.005	EA
15	0.006	0.005	EA
16	0.009	0.005	EA
17	0.012	0.01	EA
18	0.011	0.01	EA
19	0.009	0.005	EA
20	0.027	0.01	EA
21	0.1	0.01	LC
22	0.1	0.01	EA
23	0.1	0.1	EA
24	0.011	0.01	EA
25	0.085	0.01	EA
26	0.1	0.01	EA
27	0.009	0.01	EA
28	0.013	0.01	EA
29	0.1	0.01	EA
30	0.009	0.01	EA
31	0.1	0.01	EA
32	0.031	0.01	EA
33	0.013	0.005	EA
34	0.012	0.01	EA
35	0.008	0.01	EA
36	0.024	0.01	EA
37	0.023	0.01	EA
38	0.101	0.005	EA
39	0.01	0.005	EA
40	0.1	0.01	EA
41	0.011	0.01	EA
42	0.005	0.01	EA
43	0.008	0.005	EA
44	0.127	0.01	LC

*"EA" Represents Environmental Analytical

APPENDIX D

CHEMETCO, INC.
COOLING WATER CANAL CLOSURE
SAMPLING RESULTS
(EP TOXICITY)

Sample No.	Lead	Cadmium	Lab
1A	BDL	BDL	ERT
2A	BDL	BDL	ERT
3A	BDL	BDL	ERT
4A	BDL	BDL	ERT
5A	BDL	BDL	ERT
6A	BDL	BDL	ERT
7A	BDL	BDL	ERT
8A	BDL	BDL	ERT
9A	BDL	BDL	ERT
10A	BDL	BDL	ERT
11A	BDL	BDL	ERT
12A	BDL	BDL	ERT
13A	BDL	BDL	ERT
14A	BDL	BDL	ERT
15A	BDL	BDL	ERT
16A	BDL	BDL	ER
17A	BDL	BDL	ERT
18A	BDL	BDL	ERT
19A	BDL	BDL	ERT
20A	BDL	BDL	ERT
21A	BDL	BDL	ERT
22A	BDL	BDL	ERT
23A	BDL	BDL	ERT
24A	BDL	BDL	ERT
25A	BDL	BDL	ERT
26A	BDL	BDL	ERT
27A	BDL	BDL	ERT
28A	BDL	BDL	ERT
29A	BDL	BDL	ERT

CHEMETCO, INC.
COOLING WATER CANAL CLOSURE
SAMPLING RESULTS
(EP TOXICITY) (Continued)

Sample No.	Lead	Cadmium	Lab
30A	BDL	BDL	ERT
31A	BDL	BDL	ERT
32A	BDL	BDL	ERT
33A	BDL	BDL	ERT
34A	BDL	BDL	ERT
35A	BDL	BDL	ERT
36A	BDL	BDL	ERT
37A	BDL	BDL	ERT
38A	BDL	BDL	ERT
39A	BDL	BDL	ERT
40A	BDL	BDL	ERT
41A	BDL	BDL	ERT
42A	BDL	BDL	ERT
43A	BDL	BDL	ERT
44A	BDL	BDL	ERT
45A	BDL	BDL	ERT
46A	BDL	BDL	ERT
47A	BDL	BDL	ERT
48A	BDL	BDL	ERT
49A	BDL	BDL	ERT
50A	BDL	BDL	ERT

APPENDIX E

CHEMETCO, INC

ZnO STORAGE PILE CLOSURE

SAMPLING RESULTS

(EP TOXICITY)

Sample No	Lead mg/l	Cadmium mg/l	Lab
A1	BDL	BDL	ERT
A2	BDL	BDL	ERT
A3	BDL	BDL	ERT
A4	BDL	BDL	ERT
A5	BDL	BDL	ERT
B1	BDL	BDL	ERT
B2	BDL	BDL	ERT
B3	BDL	BDL	ERT
B4	BDL	BDL	ERT
B5	BDL	BDL	ERT
C1	BDL	BDL	ERT
C2	BDL	BDL	ERT
C3	BDL	BDL	ERT
C4	BDL	BDL	ERT
C5	BDL	BDL	ERT
D1	BDL	BDL	ERT
D2	BDL	BDL	ERT
D3	BDL	BDL	ERT
D4	BDL	BDL	ERT
D5	BDL	BDL	ERT
E1	BDL	BDL	ERT
E2	BDL	BDL	ERT
E3	BDL	BDL	ERT
E4	BDL	BDL	ERT
E5	BDL	BDL	ERT
F1	BDL	BDL	ERT
F2	BDL	BDL	ERT
F3	BDL	BDL	ERT

APPENDIX F

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SLAG_ANALYSIS_REPORT

DATE	F	HEAT	FRM	WEIGHT	TEMP	CU	FE	PB	SN	ZN	SIO2	CAO	AL2O3
080186	3	531	RCN	100000		.12	37.06	.53	.21	6.38	28.52	5.10	1.39
080186	1	498	JRT	140000	1900	.14	34.36	1.68	.21	7.00	27.60	3.56	5.45
080186	3	534	CLE	120000	2000	.25	39.40	.87	.14	5.28	26.98	3.15	3.05
080186	4	754	CLE	70000	2100	.45	31.54	.57	.14	5.40	27.67	4.50	6.58
080186	3	536	RCN	100000		.16	41.56	.78	.26	2.96	27.80	5.72	2.03
080286	1	500	RCN	70000		.42	28.03	.43	.14	8.09	29.52	4.17	10.28
080286	2	668	RCN	70000		.55	30.69	.55	.15	6.74	27.65	3.31	7.25
080286	1	501	RCN	70000		.69	31.94	.34	.09	4.54	29.55	3.81	12.61
080286	2	669	RCN	70000		.68	26.56	.38	.14	6.59	30.79	4.50	15.62
080286	3	538	BWH	140000		.12	35.55	.69	.15	4.66	30.35	5.25	2.49
080286	2	670	BWH	70000		.28	32.29	.43	.12	5.55	28.52	3.91	9.51
080286	1	502	BWH	70000		.47	32.89	.18	.10	6.17	27.84	4.42	11.64
080286	1	503	CLE	140000	2000	.55	25.01	.73	.21	6.80	27.39	2.84	7.87
080286	2	672	CLE	50000	2150	.89	27.09	1.24	.62	7.75	37.29	2.43	3.65
080286	3	540	CLE	140000	2000	.19	39.20	.63	.19	5.84	24.79	3.53	1.66
080286	1	504	JRT	60000	1800	.55	28.04	.60	.22	8.42	27.59	3.50	6.42
080386	1	505	JRT	45000	1800	.29	28.75	1.89	.29	13.70	25.63	4.83	1.66
080386	3	542	RRL	150000	2100	.13	35.65	.72	.11	5.54	30.76	4.47	1.20
WEIGHTED AVG				1675000		.33	33.36	.75	.18	6.18	28.47	4.06	5.45

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